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BEETLES ASSOCIATED WITH SLIME MOLDS (MYCETOZOA) IN OREGON AND CALIFORNIA (COLEOPTERA: LEIODIDAE, SPHINDIDAE, LATHRIDIIDAE)

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Although the slime molds (Mycetozoa, or Myxomycetes) are an abundant and remarkably isolated group of organisms (Olive, 1975), there has been little recognition in the American literature of a beetle faunule adapted to feed on mycetozoan fruiting structures. This omission is likely due to most entomologists being unfamiliar with slime molds, which are often minute and often resemble certain types of true Fungi. The present paper records 11 species of beetles found by the author in four genera of slime molds in Oregon, and two beetle species found in two slime molds in California. This "guild" is compared with previously reported beetle associates of mycetozoans, principally those compiled from the European literature by Benick (1952).

Beetles have been collected in the following mycetozoans: *Fuligo septica* (Gmelin) and *Reticularia lycoperdon* (Ehrenb.), both occurring as massive compound sporangia (aethalia), and *Arcyria denudata* (L.) and *Stemonitis* spp., which occur as dense and sometimes extensive patches of stalked sporangia. *Lycogala epidendrum* (L.) has been cited as a host for *Sphindus* spp. in Europe, but I have found no beetles in two collections of this puffball-like species (Benton County, Oregon). Andrews (1977) has given the only published records of North American beetles from *Fuligo* and *Arcyria* and I have seen no American records for *Reticularia* as a host. Only a few definite records are available for beetles from other mycetozoan genera (Table 1).

Collections of *Fuligo* from widely separated Oregon localities have yielded 10 beetle species: *Sphindus crassulus* Csy. and *Odontosphindus clavicornis* Csy. (Sphindidae); *Enicmus cordatus* Belon (Lathridiidae); *Anisotoma confusa* Horn, *Anisotoma errans* Brown, *Anisotoma nevadensis* Brown, *Agathidium contiguum* Fall, *Agathidium pulchrum* LeC., *Agathidium brevisternum* Fall, and *Agathidium californicum* Horn (Leiodidae). As many as three species of beetles have been found in a single aethalium. These collections include the first Oregon records for the family Sphindidae. (Collection records are listed separately below.)

Most of the *Fuligo* associated beetles were found in mature, dry aethalia,

Table 1. Previously reported and new records of beetles associated with slime-molds.

Beetle	Beetle family	Slime mold[1]	Slime mold family[1]	Reference
1. *Oxytelus tetracarinatus* (Block)	Staphylinidae	*Reticularia olivacea* (Ehrenburg)	Reticulariidae	Benick (1952)
2. *Xantholinus punctulatus* Paykull	Staphylinidae	*R. olivacea*	Reticulariidae	Benick
3. *Quedius cruentus* (Olivier)	Staphylinidae	*R. olivacea*	Reticulariidae	Benick
4. *Q. mesomelinus* (Marsham)	Staphylinidae	*R. olivacea*	Reticulariidae	Benick
5. *Philonthus fimetarius* (Gravenhorst)	Staphylinidae	*R. olivacea*	Reticulariidae	Benick
6. *Atheta amicula* (Stephens)	Staphylinidae	*R. olivacea*	Reticulariidae	Benick
7. *A. aterrima* (Gravenhorst)	Staphylinidae	*R. olivacea*	Reticulariidae	Benick
8. *A. fungicola* (Thomson)	Staphylinidae	*R. olivacea*	Reticulariidae	Benick
9. *A. inoptata* (Sharp)	Staphylinidae	*R. olivacea*	Reticulariidae	Benick
10. *A. oblita* (Erichson)	Staphylinidae	*R. olivacea*	Reticulariidae	Benick
11. *Bacanius rhombophorus* Aube	Histeridae	*Fuligo septica* (Linne)	Physaridae	Benick
12. *Agathidium confusum* Bristol	Leiodidae	*Reticularia lycoperdon* (Bullard)	Reticulariidae	Benick
13. *A. rhinoceros* Sharp	Leiodidae	*R. lycoperdon*	Reticulariidae	Benick
14. *A. seminulum* (Linne)	Leiodidae	*Arcyria denudata* (Linne)	Trichiidae	Benick
		Fuligo septica	Physaridae	Benick
		Reticularia lycoperdon	Reticulariidae	Benick
15. *A. sphaerula* Reitter	Leiodidae	*Arcyria denudata*[2]	Trichiidae	Benick
		Reticularia lycoperdon	Reticulariidae	Benick
16. *A. pulchrum* LeConte	Leiodidae	*Stemonitis* sp.	Stemonitidae	Hatch (1957)
		Fuligo septica	Physaridae	PRESENT PAPER
		Arcyria denudata	Trichiidae	PRESENT

Table 1. Continued.

Beetle	Beetle family	Slime mold[1]	Slime mold family[1]	Reference
17. *A. rotundulum* Mannerheim	Leiodidae	*A. denudata*	Trichiidae	PRESENT
18. *A. californicum* Horn	Leiodidae	*Fuligo septica*	Physaridae	PRESENT
19. *A. brevisternum* Fall	Leiodidae	*F. septica*	Physaridae	PRESENT
20. *A. contiguum* Fall	Leiodidae	*F. septica*	Physaridae	PRESENT
21. *Amphicyllis globiformis* Sahlberg	Leiodidae	slime mold	?	Benick
22. *Anisotoma axillaris* Gyllenhal	Leiodidae	*Reticularia lycoperdon*	Reticulariidae	Benick
23. *A. castanea* Herbst	Leiodidae	*R. lycoperdon*	Reticulariidae	Benick
		Fuligo septica	Physaridae	Benick
24. *A. glabra* Kugel	Leiodidae	slime mold	?	Benick
25. *A. humeralis* Fabricius	Leiodidae	*Reticularia lycoperdon*	Reticulariidae	Benick
26. *A. orbicularis* Herbst	Leiodidae	*R. lycoperdon*	Reticulariidae	Benick
27. *A. confusa* Horn	Leiodidae	*Fuligo septica*	Physaridae	PRESENT
28. *A. errans* Brown	Leiodidae	*F. septica*	Physaridae	PRESENT
29. *A. nevadensis* Brown	Leiodidae	*F. septica*	Physaridae	PRESENT
30. *Thymalus limbatus* (Fabricius)	Ostomidae	*Reticularia lycoperdon*	Reticulariidae	Benick
31. *Reveliera californica* Fall	Lathridiidae	*Arcyria versicolor* Phillips	Trichiidae	Andrews (1977)
32. *Enicmus cordatus* Belon	Lathridiidae	*Fuligo septica*	Physaridae	PRESENT
		Stemonitis sp.	Stemonitidae	Hatch, PRESENT
33. *E. tenuicornis* LeConte	Lathridiidae	*Stemonitis axifera* (Bullard)	Stemonitidae	PRESENT
34. *E. fungicola* Thomson	Lathridiidae	*Reticularia lycoperdon*	Reticulariidae	Benick
35. *E. rugosus* (Herbst)	Lathridiidae	*Fuligo septica*	Physaridae	Benick
		Reticularia lycoperdon	Reticulariidae	Benick

Table 1. Continued.

Beetle	Beetle family	Slime mold[1]	Slime mold family[1]	Reference
36. *E. testaceus* (Stephens)	Lathridiidae	*R. lycoperdon*	Reticulariidae	Benick
37. *C. consimilis* (Mannerheim)	Lathridiidae	slime mold	?	Benick
38. *E. hirtus* Gyllenhal	Lathridiidae	slime mold	?	Benick
39. *E. minutus* (Linne)	Lathridiidae	slime mold	?	Benick
40. *Lathridius nodifer* Westwood	Lathridiidae	slime mold	?	Benick
41. *Aspidophorus lareyniei* Duval	Sphindidae	slime mold	?	Benick
42. *A. orbiculatis* Gyllenhal	Sphindidae	*Reticularia lycoperdon*	Reticulariidae	Benick
43. *Odontosphindus clavicornis* Casey	Sphindidae	*Fuligo septica*	Physaridae	Andrews, PRESENT
		Stemonitis sp.	Stemonitidae	Hatch (1962)
44. *O. denticollis* (LeConte)	Sphindidae	slime mold (?)	?	Frost (1947)[3]
45. *Sphindus crassulus* Casey	Sphindidae	*Fuligo septica*	Physaridae	PRESENT
46. *S. dubius* Gyllenhal	Sphindidae	*Lycogala epidendrum* (Linne)	Liceidae	Benick
		Fuligo septica	Physaridae	Benick
		Reticularia lycoperdon	Reticulariidae	Benick
47. *S. grandis* Hampe	Sphindidae	slime mold	?	Benick
		Lycogala sp.	Liceidae	Crowson (1955)

[1] The nomenclature used is after Martin and Alexopoulos (1969), but names are given according to zoological usage, as in Olive (1975).
[2] Benick gives this host as *Trichia cinnabara,* a synonym of *Arcyria denudata* (Martin and Alexopoulos, 1969).
[3] Frost does not cite this as a slime mold; this interpretation is highly likely from his description.

but the *Anisotoma* species have been taken more frequently in moist specimens which were transforming from the plasmodial phase. The lathridiids and sphindids were found throughout the powdery spore-bearing tissue of aethalia which varied in size from 3 cm to 10–15 cm diameter. The *Fuligo* specimens lacked evident entrance holes, which suggests that most of the beetles had developed *in situ*. Two lathridiid larvae were found with *E. cordatus* in 1 sample of *Fuligo,* and larvae and pupae of *O. clavicornis* were dissected from another *Fuligo* specimen. No insects other than the beetles mentioned were observed in any samples of *F. septica*.

Stemonitis spp. have also yielded both adults and larvae of *Enicmus*. Twenty-two adult *E. tenuicornis* LeC. were collected from a 3 cm wide patch of *Stemonitis axifera* (Bull.) under loose bark of a *Lithocarpus* log in Amador County, California. Several larvae were found with the adult *E. tenuicornis* and two were reared to the adult stage. Many *E. cordatus* were taken from a *Stemonitis* (species indet.) under oak bark in Benton County, Oregon.

A large collection of *Arcyria denudata* (L.) found on the Oregon coast in November, yielded adults of *Agathidium pulchrum* LeC. and *Agathidium rotundulum* Mann., as well as *Agathidium* larvae on and among the sporangia. Two *Agathidium rotundulum* adults were reared from larvae in this collection. A second collection of *Arcyria denudata* from near San Bernardino, California contained three adult *Agathadium pulchrum*.

Of the 12 beetle species listed above, only *Agathidium pulchrum* is known to be a general fungivore; I have found adults and larvae of this species in Oregon on the "oyster mushroom," *Pleurotus ostreatus* group, and on a jelly fungus, *Tremella mesenterica* (S. F. Gray) Pers., both of which are Basidiomycetes. I have also seen a specimen of *Agathidium pulchrum* labelled "on slime mold plasmodium" from King County, Washington (D.V. McCorkle, collector). *Enicmus cordatus* has been recorded from *Neotoma* nest, under bark, and in willow duff (Hatch, 1962), but it is my view (supported by F. G. Andrews, personal communication) that Mycetozoa are the usual breeding substrate for this species and perhaps for all *Enicmus* species in western North America. *Odontosphindus clavicornis* has been collected from the slime mold *Stemonitis* sp. in British Columbia (Hatch, 1962), and Andrews (1977) also records it from *Arcyria versicolor* Phill. and *F. septica* in California; no useful host records are available for the other beetle species above. *Agathidium rotundulum* and *Agathidium brevisternum* are relatively abundant in Berlese extracts from forest litter and may also be general fungivores; since *Anisotoma* spp. and the sphindids are rarely encountered except in flight (including light-trap collections), their occurrence in mycetozoans as reported here is likely to be obligatory. All the beetles listed here are related to beetles in Europe which are indicated as slime mold specialists (Benick, 1952).

Comparison with Known Insect Associates of Mycetozoa

The only available faunal area to compare with these West Coast slime mold beetles is Europe. There, as in North America, the best-documented association of a beetle taxon with Mycetozoa is for the Sphindidae. Benick (1952) lists four species of *Sphindus* and *Aspidophorus* from mycetozoans of the genera *Lycogala* and *Reticularia* (but also, less frequently from a few polypore and agaric fungi among the Basidiomycetes). Crowson (1955) stated that both British genera (*Sphindus, Aspidophorus*) "as far as known, feed exclusively on Mycetozoa."

In contrast, most American authors have characterized the Sphindidae as "dry-fungus beetles." Arnett (1963) for instance, indicates their habitat as being "in dry fungi, mostly shelf fungi on tree trunks and old logs." Aside from Hatch's (1962) record of *Odontosphindus clavicornis* on the slime mold *Stemonitis,* the only interpretable American host records for sphindids are those of Frost (1947) of *Sphindus americanus* in association with cisid species on "small, crowded, woody fungi," which may be the basidiomycete *Polyporus versicolor* or a similar species, and of *Odontosphindus denticollis* (LeC.) (as *Eurysphindus denticollis*) in a "flat, brown fungus of a soft smut-like consistency." The latter description is rather obviously of a mycetozoan. The usual occurrence of *O. clavicornis* in slime molds, and my single record of *Sphindus crassulus* in *Fuligo* further increase the probability that this host association is usual, if not exclusive, in the Sphindidae. While observations of sphindids apparently feeding on polypore fungi cannot be completely discounted, they may have been confounded by the frequent occurrence of mycetozoan plasmodia in old polypore sporocarps (Martin and Alexopoulos, 1969). The common application of the term "polypore" to almost any dry or woody sporocarp also makes acceptance of such records questionable.

The other genera of beetles reported here from slime molds are also probable mycetozoan specialists. All of the seven species of *Anisotoma* and six species of *Enicmus* in Benick's list of European mycophagous beetles have been reported from slime molds. In most cases this is the usual or exclusive substrate, although *Enicmus* species are rather often cited from hosts among the true Fungi. Benick also reported four of 19 listed species of *Agathidium* from slime molds; the host restrictions in this genus vary at the species level. Of the European beetle genera commonly cited from mycetozoan hosts, only *Amphicyllis* (Leiodidae) is missing from my collections; this genus does not occur in North America.

Although I found different species on *Fuligo* and on *Arcyria,* there is no good evidence of specialization on particular mycetozoan hosts. In part I have observed a seasonal effect, for *Enicmus* and the Sphindidae are evidently adapted to very xeric conditions, while the Leiodidae require more moisture, and are (in the Pacific Northwest) more typically active in cool,

moist weather. The aethalia containing *Anisotoma* and *Agathidium* were usually located in moist sites under bark or on the surface in deep shade, while *Enicmus* and *Odontosphindus* were often found in very exposed sites. The mycetozoans listed as hosts in Table 1 belong to four of the five orders of Myxogastria (the true slime molds) recognized by Oliver (1975); it is likely that all slime mold sporangia of sufficient size are subject to attack by beetles.

It is probable that most or all of the Coleoptera specializing on mycetozoans feed on the spores; Andrews (1977) has found this to be the case for the lathridiid *Reveliera californica* Fall. The basis for the differentiation of Mycetozoa as a coleopteran food-niche may be nutritional, or be related to the rapid desiccation of the slime mold. The slime mold fauna is clearly derived from mycophagous taxa, even though the Mycetozoa are best regarded as colonial Protozoa not directly related to the true Fungi (Olive, 1975). It is interesting to note that this speciality can be observed among the Coleoptera at the family (Sphindidae), genus (*Anisotoma, Enicmus*), and species (*Agathidium,* in part) taxonomic levels.

Aside from beetles the Diptera appear to be the only important insect associates of slime molds. Buxton (1954) bred 16 species of flies, representing 10 families, from mycetozoans. These included several apparent slime mold specialists, as well as a number of common saprozoic species which feed on rotting plasmodia. The absence of fly-infested material from my collections presumably accounts for the lack of predatory, mycetophilous staphylinids in my list, in contrast to those cited by Benick (1952).

Collection Data

Fuligo septica (Gmelin)

Oregon: Benton County. a) MacDonald State Forest, VII-18-75, Loren Russell Collector. 1 aethalium on Douglas fir stump: *Odontosphindus clavicornis* Csy. (10 specimens), *Sphindus crassulus* Csy. (1), *Enicmus cordatus* Bel. (14). Many beetles escaped. b) Marys Peak, 610 m elevation, V-8-77, Loren Russell. 1 aethalium on small branch: *Anisotoma errans* Brown (5). c) Marys Peak, 610 m, V-3-88, Loren Russell. 1 moist aethalium on stump. *Agathidium pulchrum* LeConte (1), *Agathidium brevisternum* Fall (1).

Marion County. Mt. Jefferson Wilderness Area, 10 km SE Breitenbush Hot Springs, 600 m, VIII-24-75, Bill Frost. 1 moist aethalium on Douglas fir stump: *Anisotoma confusa* Horn (12).

Jefferson County. a) 8 km N Suttle Lake, 930 m, VIII-9-75, Loren Russell. 3 aethalia on ponderosa pine litter on old log: *O. clavicornis* (38 adults, 5 pupae, 2 larvae), *E. cordatus* (3), *Anisotoma errans* Brown (2). b) Metolius River area, 900–950 m, V-28-76, Loren Russell and P. J. Johnson. Aethalia under bark of ponderosa pine stumps: *O. clavicornis* (7), *E. cordatus* (3),

Anisotoma confusa (4). c) Dark Lake, IX-14-77, G. L. Peters. Several aethalia. *O. clavicornis* (1), *E. cordatus* (5), *Agathidium contiguum* Fall (47), unidentified leiodid (2).

Crook County. Bandit Springs Wayside, 1 km SW Ochoco Summit, 1380 m, V-29-76, P. J. Johnson. 1 aethalium under pine bark: *Anisotoma confusa* (2), *Agathidium californicum* Horn (1).

Wheeler County, Ochoco Divide Campground, 1350 m, VII-16-77, Loren Russell. 2 fresh aethalia on Douglas fir log: *Anisotoma nevadensis* Brown (14), *Agathidium contiguum* (4), *O. clavicornis* (43).

Klamath County. Lake of the Woods, 1500 m, VII-20-75, Loren Russell. 5 small aethalia on pine litter: *E. cordatus* (34).

Reticularia lycoperdon (Ehrenb.)

Oregon: Crook County. Maury Mtns., Drake Butte, 1890 m, VII-25-76, Loren Russell. 1 old eroded aethalium, 1 fresh aethalium on cut surface of pine stump: *E. cordatus* (18).

Arcyria denudata (L.)

Oregon: Tillamook County. Cascade Head, Nature Conservancy Trail, XI-21-75, Loren Russell. One 30 × 5 cm patch of eroded sporangia on side of red alder log: *Agathidium pulchrum* (3), *Agathidium rotundulum* Mannerheim (1 adult, 2 others reared from larvae on this sample).

Linn County. 5 km SE Jordan, VII-2-77, Loren Russell. In moist cavity of rotted maple stump: *Agathidium pulchrum* (7).

California: Los Angeles County. Mt. San Antonio, IV-27-76, Loren Russell. Small patch of sporangia on log buried in river bar: *Agathidium pulchrum* (3).

Stemonitis axifera (Bull.)

California: Amador County. 2 km E Jackson, V-4-76, Loren Russell. 3 cm patch of sporangia under loose bark of *Lithocarpus*: *Enicmus tenuicornis* LeConte (22 adults, several larvae).

Stemonitis sp. indet.

Oregon: Benton County. a) MacDonald State Forest, VIII-21-76, G. L. Peters. Under bark of oak log: *E. cordatus* (18). b) Same locality and host, VI-26-77 Loren Russell *E. cordatus* (3).

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fications were checked by Donald Kowalski, Chico State College, California; the lathridiids were determined by Fred Andrews, California Dept. of Agriculture, and the sphindids identified by J. F. Lawrence, Harvard University.

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THE LARVAL STAGE OF *HYDROPSYCHE SEPARATA* BANKS (TRICHOPTERA: HYDROPSYCHIDAE)

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There is some confusion concerning the name used for the species which Banks (1936) described under the name *Hydropsyche separata* Banks. Banks (1936) described the male of *H. separata* and Denning (1943) described the female, illustrated the female genitalia and provided a more complete drawing of the male genitalia of this species. Ross and Spencer (1952) suggested *H. separata* described from North America was a synonym of the European species *Hydropsyche guttata* Pictet. Ross (1965), in a primarily zoogeographical paper, stated that *H. guttata* and *H. separata* were distinct species. Personal communications with other Trichoptera taxonomists and the published literature (e.g., Baumann and Winget, 1975), however, indicate that the name *H. guttata* is still used to refer to the species *H. separata*.

Discussion

Dr. Hans Malicky (from the Biologische Station Lunz, Lunz, Austria) kindly sent me male specimens of *H. guttata* and I sent him males of *H. separata*. After comparing these two species we concluded that they are distinctly different (even the number of tibial spurs differ in the males). This conclusion supports Ross's (1965) view that the species *H. guttata* and *H. separata* are separate species and that the name *H. guttata* should not be used to refer to the species *H. separata* which Banks described in 1936.

Ross (1965) suggested that *H. separata* and *H. guttata* are daughter species of a common ancestor but Dr. Malicky (pers. comm., 1977) found that, based on male specimens, *H. separata* is more closely related to a European species which he had recently described (Malicky, 1977), *Hydropsyche bulgaromanorum* Malicky, than to *H. guttata*.

Dr. A. P. Nimmo (oral comm., 1978) notes that the species *Hydropsyche corbeti* Nimmo which he described (Nimmo, 1966) may be a synonym of *Hydropsyche separata*. The drawing of the male genitalia of *H. separata* in Denning (1943) and the male genitalia of specimens of *H. separata* which I examined are extremely similar to the drawings of the male genitalia of *H. corbeti* presented by Nimmo (1966). Since I have not, as yet, examined the type of *H. corbeti,* I can only state that my observations on the close

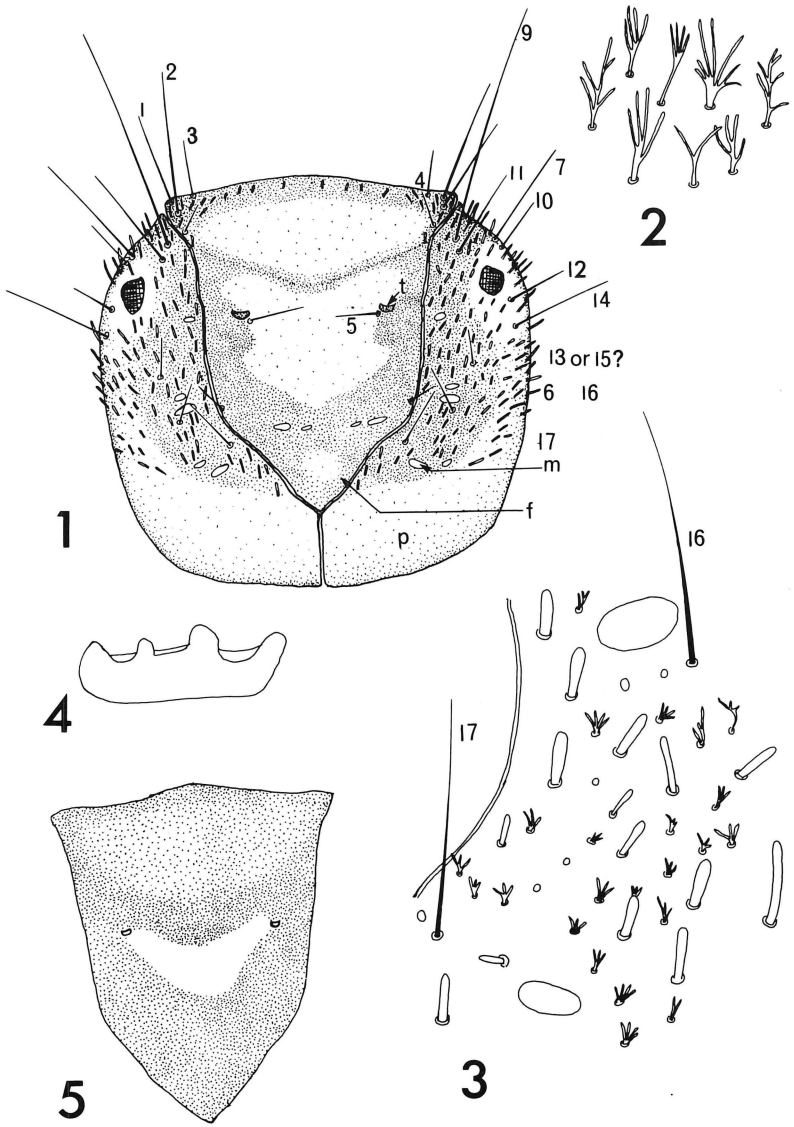
similarity of the genitalia of *H. corbeti* and *H. separata* suggest Nimmo is correct in regarding *H. corbeti* as a possible synonym of *H. separata*.

The Larval Stage of *Hydropsyche separata*

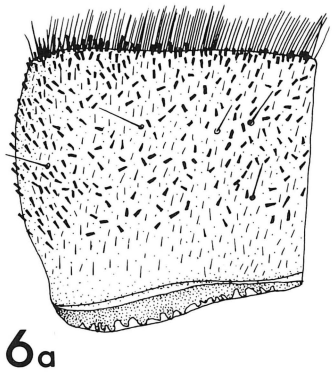
The most distinctive features of the *H. separata* larva are the pattern on the dorsum of the head, the prominent bump on the meson of the anterior margin of the anterior ventral apotome, the fine, branched hairs on the frontoclypeal apotome, the mandibles which have a deep lateral furrow bearing several setae and the relatively long, wide, scale-like setae on the abdominal terga.

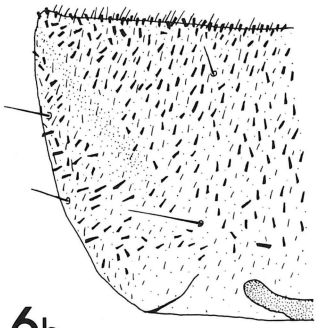
In the detailed description of the larva which follows, the terminology used is taken primarily from Wiggins (1977).

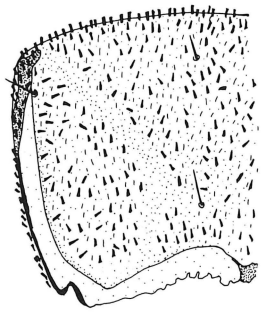
General description.—Dorsum of head dark with lighter markings, sides and venter yellow, often with a pair of dark patches on venter. Rarely, head entirely dark except for region about each eye. Frontoclypeal apotome (Figs. 1, 5) slightly indented laterally; anterior margin convex, often with minute bumps along edge, minute branched setae on lateral portions of anterior margin; anterior portion of apotome with short scale-like setae behind anterior margin and on anterolateral surface but otherwise bare of such setae, often with large light oval area on middle; middle of apotome with V-shaped (Fig. 5) or lyre-shaped (Fig. 1) light area or rarely, light area absent, tentorial pits distinct, often four or five light muscle scars anterad of tentorial pits in a shallow, transverse depression; posterior portion of apotome with two to four light muscle scars in middle, structure illustrated in Figure 4 evident in cleared specimens within cuticle of apotome in light area near vertex of frontoclypeal apotome (structure approximately one-quarter as wide as the frontoclypeal apotome at level of seta 6) posterad of four muscle scars; posterior three-quarters of apotome covered with fine, branched setae (Fig. 2). Each parietal sclerite with numerous short scale-like setae and smaller, branched, fine setae (Fig. 3) on dorsal and lateral regions of anterior three-quarters of head (Fig. 1); pair of light muscle scars anterad of seta 16 (Fig. 1), a single light muscle scar above eye near frontoclypeal suture, often several lighter muscle scars in posterior region of dorsum. Head setae 1 and 3 along anterior margin of frontoclypeal apotome (Fig. 1); seta 2 posterad of seta 1; seta 4 posterad of seta 2; seta 5 near posteromesal margin of tentorial pit; seta 6 near frontoclypeal suture at level of seta 16; setae 7 and 10 anterad of eye; setae 9 and 11 anterad and dorsad of eye; setae 12 and 14 posterad and ventrad of eye; setae (13 or 15?) anterad and laterad of seta 16; seta 16 posterad of pair of small muscle scars near frontoclypeal suture; seta 17 beside frontoclypeal suture where frontoclypeal apotome begins to narrow to posterior tip; seta 8 on lateral surface near anterior margin of head; seta 18 in middle of ventral surface of parietal

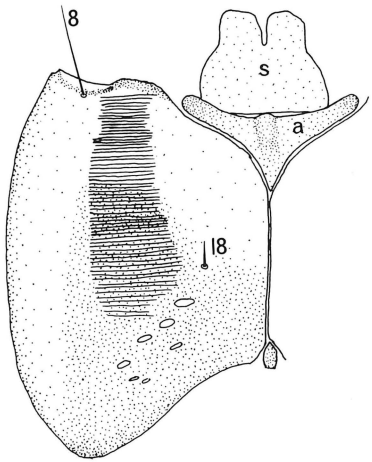


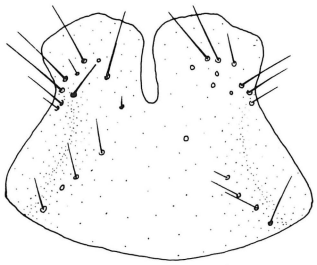
Figs. 1–5. Morphological features of *Hydropsyche separata*. Fig. 1—Head, dorsal aspect; t = tentorial pit, f = frontoclypeal apotome, m = muscle scar, p = parietal sclerite. Fig. 2—Setae on posterior portion of frontoclypeal apotome. Fig. 3—Setae on dorsum of parietal sclerite. Fig. 4—Structure within cuticle near posterior tip of frontoclypeal apotome (arrow extending from f in Fig. 1 indicates approximate position of structure). Fig. 5—Frontoclypeal apotome showing only coloration.

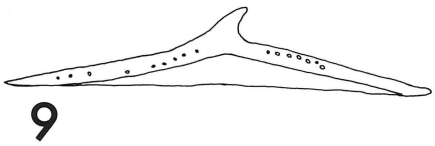




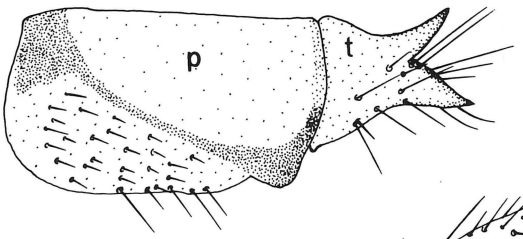








Figs. 6–9. Morphological features of *Hydropsyche separata*. Fig. 6—Left side of thoracic nota; a = pronotum, b = mesonotum, c = metanotum. Fig. 7—Right side of head capsule, ventral aspect; s = submentum, a = anterior ventral apotome. Fig. 8—Submentum, ventral aspect. Fig. 9—Tooth from proventriculus.



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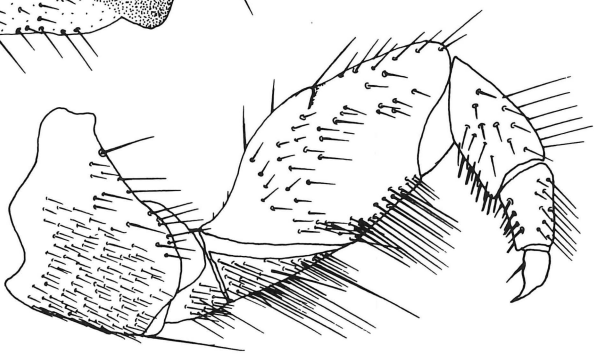

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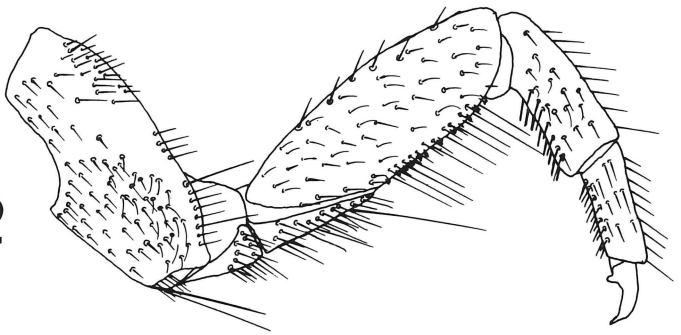

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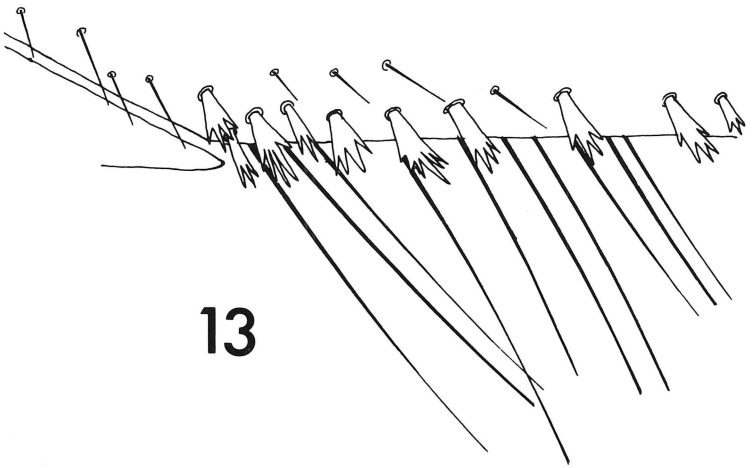

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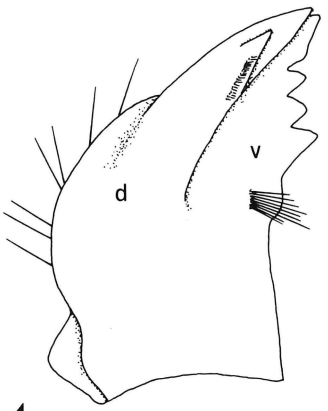
sclerite (Fig. 7); setae 3, 4, 5, 6, 10, 12, (13 or 15?), 16 and 17 short, setae 1, 2, 7, 8, 11 and 14 medium and seta 9 long in length. Labrum with a dense covering of short unbranched setae on anterior three-quarters of dorsum, one pair of setae near anterior margin longer than other setae. Mandibles (Fig. 14) with a deep lateral trough, numerous setae along base of trough. Left mandible (Fig. 14a) with an apical and subapical tooth on dorsal part, brush of small setae near mesal margin of subapical tooth; ventral part with an apical and four subapical teeth, basal subapical tooth short, rounded triangular, a brush of long setae above basal tooth. Right mandible (Fig. 14b) with a single tooth on dorsal part, brush of small setae situated obliquely on tooth; ventral part with an apical and four subapical teeth; basal subapical tooth short rounded triangular. Submentum (Fig. 8) with lateral surface on each side bulging upward from base of apical lobe posterad to posterolateral corner; setae grouped near base of each apical lobe and in an oblique line on each posterolateral corner; anterior margin of each apical lobe rounded or rounded triangular. Anterior ventral apotome (Fig. 7) with a bump on meson near anterior margin; lateral arms long, narrow, enlarged slightly at apex. Proventricular teeth of foregut each with a single apical denticle (Fig. 9), long basal portion with several scattered bead-like areas, support bars absent.

Pronotum, mesonotum and metanotum (Figs. 6a, b, c) each yellow to brown, covered with a dense covering of short scale-like setae and even shorter pointed setae (Fig. 6); pronotum (Fig. 6a) with scale-like setae only on anterior three-quarters, anterior margin with numerous fine setae; mesonotum (Fig. 6b) and metanotum (Fig. 6c) each with scale-like setae projecting beyond anterior margin. Trochantin of propleuron (Fig. 10) with numerous setae along ventral portion, dorsal apical lobe upturned and pointed. Foreleg with minute branched setae on most of posterior surface of coxa; femur with prominent lobe on middle of anterodorsal surface (Fig. 11). Midleg with branched setae only on ventral part of posterior surface of coxa; femur (Fig. 12) with branched setae on anteroventral surface (Fig. 13); no branched setae on tibia or tarsus. Hindleg without branched setae on posterior surface of coxa; femur with branched setae on anteroventral surface; tibia and tarsus without branched setae. Mesosternum with one pair of gills, each gill with a single trunk; metasternum with two pairs of gills, each gill with a single trunk.

←

Figs. 10–13. Morphological features of *Hydropsyche separata*. Fig. 10—Trochantin and propleuron, lateral aspect; t = trochantin, p = propleuron. Fig. 11—Foreleg, anterior aspect. Fig. 12—Midleg, anterior aspect. Fig. 13—Ventral margin of femur, anterior aspect showing branched setae.



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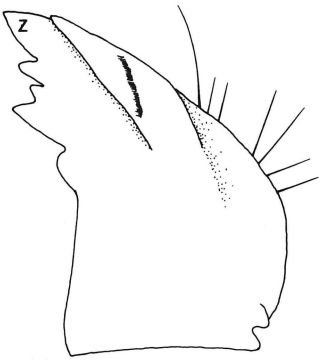

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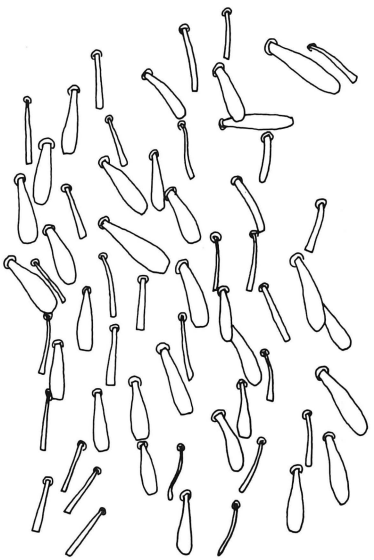

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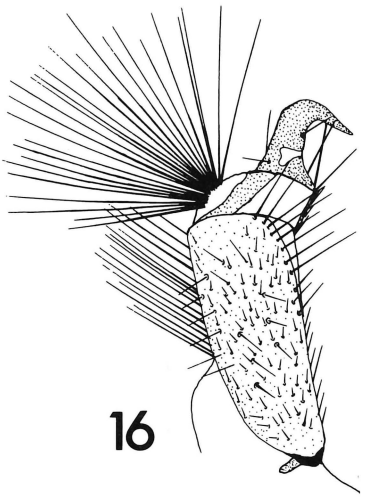

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Figs. 14–16. Morphological features of *Hydropsyche separata*. Fig. 14—Mandibles, dorsal aspect; a = left mandible, b = right mandible, d = dorsal part, v = ventral part, z = apical tooth of ventral part. Fig. 15—Scale-like setae on abdominal terga. Fig. 16—Anal proleg, lateral aspect.

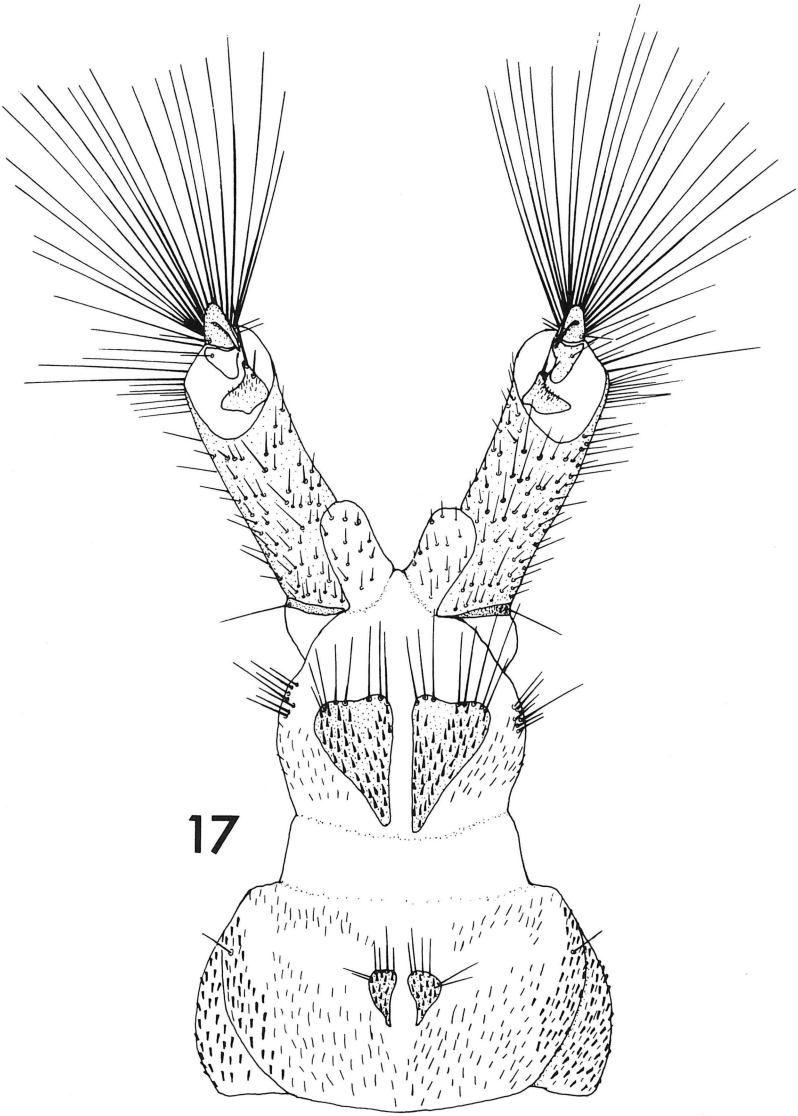

Fig. 17. Posterior end of abdomen, ventral aspect, of *Hydropsyche separata*.

Abdomen with small scale-like setae (Fig. 15) covering terga, many of these setae longer and/or stouter than in other species of the genus. First segment with two pairs of gills on sternum, each gill with a single trunk; segments II to VI each with one pair of medial gills, each gill with a single

trunk and one pair of lateral gills, each gill with a main trunk and two main branches; segment VII with one pair of gills, each gill with a main trunk and two major branches. Sterna of segments VIII and IX each with a pair of spine bearing plates (Fig. 17). Ninth tergum with a small lateral sclerite on each side. Anal proleg without spine-like setae on ventral surface (Figs. 16, 17).

Mature larvae up to 20 mm in length.

Material examined.—Includes 225 adults, 76 of which were reared from pupae and 637 larvae.

Disposition of material.—A series of adult and larval specimens of *Hydropsyche separata* will be deposited in the Royal Ontario Museum. The remainder of the specimens will be retained in the Entomology Museum of the Biology Department, University of Saskatchewan and in the author's personal collection.

Biology and Distribution

H. separata in the Saskatchewan River system in Saskatchewan, Canada has a single generation per year with an extended emergence period. Pupae were collected from May 26 to August 1, adults from May 8 to August 24. The main emergence of adults occurs in June and July. Larval collections on any one date usually contain several different instars which is usual in aquatic insect species with broad adult emergence periods. Baumann and Winget (1975) found larvae of *H. separata* to be primarily herbivorous and detrivorous feeders. The gut contents of two larval specimens of this species from the Saskatchewan River system were found to contain primarily plant material.

H. separata is widely distributed in northern North America from New York State west to British Columbia and Utah (various sources) and north to Great Slave Lake (Rawson, 1953). Baumann and Winget (1975) collected *H. separata* from the turbid waters of the relatively large White River in Utah. In Saskatchewan *H. separata* is abundant in larger turbid rivers such as the Saskatchewan, South Saskatchewan, North Saskatchewan and Battle Rivers. This species does not occur in the clear, often rapid streams of the boreal forest region of Saskatchewan. In the South Saskatchewan River the Diefenbaker Lake reservoir not only alters the seasonal temperature regime of the river downstream from it (Lehmkuhl, 1972) but it also acts as a trap for suspended matter which is brought into the reservoir by the turbid waters of the South Saskatchewan River. The water which leaves the reservoir is relatively free of suspended matter. Lehmkuhl (1972) suggested that aquatic insects are eliminated directly downstream from the Diefenbaker Lake reservoir because the annual temperature cycle of the river is altered. Further downstream, a gradual recovery of the insect fauna occurs and at Saska-

toon, approximately 70 miles downstream from the reservoir many species of aquatic insects are able to live. Collections from the South Saskatchewan River upstream from the reservoir and in the river downstream from the reservoir at Saskatoon and at several sites downstream from Saskatoon indicate that although *H. separata* is the dominant net-spinning caddisfly species upstream from the reservoir, downstream from the reservoir *Symphitopsyche recurvata* (Banks) (=*Hydropsyche recurvata* Banks) replaces *H. separata* as the dominant net-spinning species. Temperature is not likely the factor causing this change in the abundance of these two species since both species do occur upstream and downstream from the reservoir. It is more likely that the difference in the turbidity of the water upstream and downstream from the reservoir is the major factor affecting the abundance of *H. separata* and *S. recurvata* in the South Saskatchewan River. The collection of *H. separata* from the White River in Utah by Baumann and Winget (1975), the distribution of *H. separata* in the province of Saskatchewan and the distribution of this species within the South Saskatchewan River indicate that *H. separata* prefers or requires stream habitats where the water is very turbid.

Acknowledgments

I wish to express my sincere thanks to Dr. D. M. Lehmkuhl for his supervision and encouragement during the course of my studies, for making available facilities and equipment without which this research would not have been possible, for financial support from his National Research Council grant and for his constructive criticisms during the preparation of this paper. Special thanks go to Dr. Hans Malicky whose many useful comments and generous help have aided me in the publication of this paper. I would also like to thank Dr. C. Gillott and Dr. L. Burgess for reviewing the manuscript.

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SCIENTIFIC NOTE

NEW HOST RECORD FOR *CORYTHUCA DISTINCTA* (HEMIPTERA: TINGIDAE)[1]

Drake and Ruhoff (1965, Lacebugs of the world: a catalog. U.S. Natl. Mus. Bull. 243: 148) record the host plants of *Corythuca distincta* Osborn & Drake as being *Carduus lanceolatus* and *Cnicus* sp. (Compositae), *Lathyrus nuttalii* (Leguminosae) and hollyhock (=*Althaea* sp.) (Malvaceae). Specimens of *C. distincta* nymphs and adults (identified by R. C. Froeschner, U.S. Natl. Mus) were collected feeding on *Cirsium pulcherrimum* (identified by Burrell Nelson, Rocky Mountain Herbarium, Univ. Wyoming, Laramie) on July 28 and August 1, 1978 at Centennial, Wyoming. Not all the *Cirsium* plants in the patch were infested, but on severely infested plants, the tingids were present in such densities that all leaves were curled and necrotic. It was presumed that such plants would die. This infestation appeared to be an example of natural control by a native insect. According to Drake and Ruhoff (Ibid. 454–455), the only previous records for tingids feeding on *Cirsium,* are limited to five species of *Tingis* which feed on thistle in the Old World and in Asia.

Footnote

[1] Published with the approval of the Director, Wyoming Agricultural Experiment Station, as Journal Article MP-42.

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A LIST OF CERAMBYCIDAE FROM THE HUALAPAI MOUNTAINS, MOJAVE COUNTY, ARIZONA (COLEOPTERA)

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The Cerambycid fauna of montane Arizona has been extensively studied, with collecting reports having been published by Linsley et al. (1961), and Schaeffer (1908), for southeastern Arizona, and by Wickham (1896), for the more northerly portions of the state.

The Hualapais are the westernmost of the readily accessible isolated mountain ranges in north-central Arizona, and are located approximately fifty miles east of Needles, California. The Rocky Mountain Ranges extend to the northeast, and the Sierra Madre Ranges extend to the southeast, separated from the Hualapais by semiarid or arid lowlands.

The town of Kingman, elevation 3300 ft, is situated at the base of the Hualapais. A paved road on the east end of town extends thirteen miles south to Hualapai Mountain Park (6500 feet).

The principal floral elements of the lower elevations around Kingman and on the alluvial plain include Catclaw (*Acacia greggii*), *Agave* sp., Allthorn (*Canotia holocantha*) and various species of Compositae (including *Haplopappus* and *Gutierrezia*). Approximately eight miles south of Kingman the road reaches a transition zone of Oak-Juniper-Pinyon Pine woodland extending from about 4500 to 5500 ft. Within this zone, at Pinyon Pine Estates, new roads and homesites are being developed, leaving piles of uprooted and fresh-cut Single-leaf Pinyon Pine (*Pinus monophylla*), Agave, Juniper (*Juniperus virginiana* var. *scopulorum*), and Scrub Oak (*Quercus turbenella*). At higher elevations Ponderosa Pine (*Pinus ponderosa*), New Mexican Locust (*Robinia neomexicana*), Broadleaf Oak (*Quercus gambelli*), Walnut (*Juglans microcarpa*), Lilac (*Ceanothus* sp.), and various species of Compositae are predominant. Collecting localities at higher elevations include Hualapai Mountain Park (6500 feet), Flag Mine (7000 feet), and Hualapai Mountain Lodge (6000 feet).

The author has collected this area yearly over the past twelve years at various dates from June through September, and, unless otherwise stated, the following compilation of Cerambycidae is based upon his records. Fifty-seven species are listed with the previously unrecorded host plant of *Acanthocinus* (*Canonura*) *leechi* (Dillon) recorded.

Cerambycidae of the Hualapai Mountains

Ergates spiculatus neomexicanus Casey. This species has been captured at the bases of dead standing *Pinus ponderosa* at night on various dates in August.

Prionus californicus Motschulsky. Numerous records at high and mid elevations in July and August.

Prionus heroicus Semenov. Taken at ultraviolet light at mid elevation July 7–8, 1978.

Tragosoma chiricahuae Linsley. Frequent in late July and early August at black light and existing lights, at Hualapai Mountain Park.

Arhopalus asperatus (LeConte). Frequently taken at ultraviolet light and on dead standing *Pinus ponderosa* at high elevations.

Arhopalus rusticus montanus (LeConte). Occasionally taken at ultraviolet light and on dead standing *Pinus ponderosa* at high elevations. It has been reared from *Pinus ponderosa* by F. T. Hovore from wood collected at Hualapai Mountain Park in August.

Oeme costata LeConte. A totally black specimen was taken by D. S. Lewis at ultraviolet light mid elevation on June 24, 1976.

Oeme rigida deserta Casey. Several specimens were taken at ultraviolet light and mercury vapor light July 7–9, 1978 mid elevation.

Methia carinata Linsley. The type and allotype were taken at "Hualpai" Arizona by D. J. and J. N. Knull July 2nd and 6th. A few specimens assignable to this species were taken at mercury vapor light July 7–9, 1978.

Methia mormona Linell. Numerous records, June, July and August at ultraviolet light at mid elevation and high elevation at Pine Lake Lodge and Hualapai Mountain Park.

Methia lata Knull. Three specimens which I tentatively assign to this west Texan species came to ultraviolet light near Pine Lake Lodge August 3, 1965. The species is very closely allied to *Methia mormona* Linell, and may be a polymorph of that species.

Methia flavicornis Casey. A specimen was taken at 5200 ft in oak juniper woodland at ultraviolet light by E. F. Giesbert, July 11, 1977.

Methia knulli Linsley. One specimen was taken at light approximately 2 mi west of Kingman August 12, 1967, and two additional specimens at mercury vapor light July 7–9, 1978 in oak juniper woodland. The Holotype female was collected by D. J. and J. N. Knull July 3, "Hualpai" Arizona.

Methia dubia Linsley. Three specimens were taken at the agricultural inspection station two miles west of Kingman at existing lights August 1, 1965, and one specimen was taken at Pinyon Pine Estates July 11, 1977 by E. F. Giesbert.

Methia acostata Linsley. Holotype male, "Hualpai" Arizona, D. J. and J. N. Knull July 3rd.

Styloxus bicolor (Champlain & Knull). Several females were taken at black light, August 25, 1973 in oak juniper woodlands.

Malobidion brunneum Schaeffer. Numerous examples have been collected in July and August at mid and high elevations at ultraviolet light.

Eburia linsleyi Lacey. Numerous specimens have been taken at ultraviolet light in July and August at Pinyon Pine Estates. F. T. Hovore has in addition recovered them from molasses bait traps.

Eucrossus villicornis LeConte. Specimens have been collected at ultraviolet lights and at existing lights around the Pine Lake Lodge and in Pinyon Pine Estates in July and August. F. T. Hovore reared this species from dead Pinyon Pine collected at Pinyon Pine Estates, and collected a single female in a turpentine trap.

Tragidion auripenne Casey. A short series was taken in flight near Flag Mine at 7000 ft, August 12–15, 1967; and a female was beaten from Oak at Pinyon Pine Estates by F. T. Hovore.

Batyle rufiventris Knull. Two specimens of this rarely encountered species were taken in flight at the south end of Pine Lake, August 12, 1967.

Crossidius discoideus (Say). Numerous examples have been collected on *Gutierrezia* in September at about 4000 foot elevation.

Crossidius pulchellus LeConte. This species is reasonably common in September at lower elevations on *Gutierrezia* and *Haplopappus*.

Elytroleptus rufipennis (LeConte). Recorded by E. G. Linsley (1962) as taken by J. N. Knull, Hualapai Mts., 1937.

Stenosphenus beyeri Schaeffer. Occasional specimens have been taken on walnut around Pine Lake Lodge in July and August.

Neaneflus fuchsii (Wickham). One example was collected August 3, 1975 at ultraviolet light in Pinyon Pine Estates.

Aneflus sonoranus Casey. Numerous specimens have been taken at the Agricultural Inspection Station two miles west of Kingman on the existing lights July 20 and August 12, and two examples were taken at ultraviolet light, mid elevation, July 8, 1978.

Aneflomorpha citrana Chemsak. A single specimen which I determine to be this species was taken August 16, 1971 at the lights of the Agricultural Inspection Station two miles west of Kingman.

Aneflomorpha rectilinea Casey. Examples have been taken at mid and high elevations on various dates in July and August at ultraviolet light.

Aneflomorpha parkeri Knull. Specimens have been collected at ultraviolet light in July and August at mid and high elevations.

Aneflomorpha parowana Casey. Examples are taken at the low, mid and high elevations in July and August at ultraviolet light.

Micraneflus imbellis (Casey). A large series of specimens was taken two miles west of Kingman at the Agricultural Inspection Station, August 31, 1965, and occasional specimens have since been taken in July and August at the same locality at existing lights.

Enaphalodes hispicornis (Linnaeus). Examples have been taken at Pine Lake Lodge at existing lights during July and August, and at ultraviolet light in Pinyon Pine Estates during August.

Enaphalodes cylindricus (Knull). Two males and two females were taken at ultraviolet lights at Pinyon Pine Estates in August.

Eustromula validum (LeConte). Examples have been taken August 11, and September 8–12 two miles west of Kingman at the lights at the Agricultural Inspection Station.

Gymnopsyra magnipunctata (Knull). Numerous specimens were taken at ultraviolet and mercury vapor light at Pinyon Pine Estates and Hualapai Mountain Park, July and August.

Peranoplium subdepressum (Schaeffer). Single examples of this species were collected at lights two miles west of Kingman, July 31, 1965, and at mid elevation, July 9, 1978.

Anoplocurius canotiae Fisher. One specimen was taken two miles west of Kingman, August 1, 1965, at the lights of the Agricultural Inspection Station.

Anoplocurius altus Knull. Numerous examples have been taken in July and August at the mid and high elevations at ultraviolet light.

Phymatodes hirtellus densipennis Casey. One specimen was taken on *Haplopappus* July 22, 1976 in Ponderosa pine forest.

Megacyllene snowi (Casey). Several examples have been taken at high elevations on *Gutierrezia,* near stands of *Robinia neomexicana,* the host plant, on various dates in mid-September.

Centrodera nevadica arizonica Linsley and Chemsak. The type female and one male paratype were collected at Pine Lake Lodge by Lloyd Martin on June 18, 1955. One specimen was collected by E. F. Giesbert at light, June 26, 1976, at Hualapai Mountain Park.

Moneilema semipunctatum LeConte. A series of this species was taken by F. T. Hovore on *Opuntia* sp. at Pinyon Pine Estates, August 5, 1978.

Monochamus clamator (LeConte). Numerous specimens have been taken at light in July and August at Hualapai Mountain Park, and several unsuccessful emergences have been found in dead Ponderosa Pine. Occasional specimens have been taken at light in Pinyon Pine Estates in July and August.

Glaucotes yuccivorus (Fall). Numerous specimens were taken at ultraviolet light at the mid elevation and in Pinyon Pine Estates in August.

Sternidius decorus (Fall). A single specimen was beaten from dead *Quercus gambelli* by F. T. Hovore at Pine Lake August 12, 1978.

Sternidius imitans (Knull). Numerous specimens were taken at ultraviolet light in the Pinyon Pine Estates in August.

Eutrichillus neomexicanus (Champlain & Knull). Numerous examples have been collected in late July and early August at ultraviolet light at Hualapai Mountain Park; a single specimen was taken at mercury vapor light at Pinyon Pine Estates by F. T. Hovore in August.

Eutrichillus canescens Dillon. Specimens have been taken July and August at ultraviolet light and from dead standing Pinyon pine at mid elevations. One large female emerged July 1976 from *Pinus monophylla* collected September 1975.

Neacanthocinus obliquus obliquus (LeConte). Examples have been taken at light on various dates in July and August at Pine Lake Lodge.

Acanthocinus (*Canonura*) *spectabilis* (LeConte). A few specimens were taken on dead standing Ponderosa pine, August 2, 1975, and during the first week in September, 1973. They have been reared from the bark of *Pinus ponderosa* in August and September by F. T. Hovore.

Acanthocinus (*Canonura*) *leechi* (Dillon). A female specimen was taken at ultraviolet light at Pinyon Pine Estates August 4, 1975 (Lewis, 1976) and a few specimens were subsequently reared from large dead branches (4–10 inches in diameter) of *Pinus monophylla* from trees still bearing brown needles. The wood was collected in September 1975 and emergences took place in June, July and August the following year. Little (1943), reported an acanthocine larva in association with a monochamine larva commonly in the bark of dying *Pinus edulis,* 12 miles east of Flagstaff, Coconino Co., Arizona at 6500 ft. It is possible that this record refers to *A. leechi.* The type locality is Jerome, with a single specimen also having been collected near Payson, Coconino Co.

Lepturges yucca Schaeffer. A few specimens were taken at ultraviolet light at dusk in the Pinyon Pine Estates, August 2, 1975.

Valenus inornatus Casey. Several specimens were taken at ultraviolet light in July and August at Pinyon Pine Estates.

Tigrinestola tigrina (Skinner). One specimen was taken at ultraviolet light August 2, 1975 at the mid elevation.

Poliaenus obscurus (Fall). Specimens of this species were taken at black light in Pinyon pine juniper forest July and August, and from dead branchlets on living *Pinus monophylla* at night. A specimen emerged June 26, 1976 from dead *Pinus monophylla* collected September, 1975.

Oncideres quercus Skinner. Reasonably common at ultraviolet light at high elevations in July and August.

Of the fifty seven species listed above, all but *Centrodera nevadica arizonica* Linsley & Chemsak, *Aneflomorpha parowana* Casey, *Neaneflus fuchsii* (Wickham), *Batyle rufiventris* Knull, and *Acanthocinus leechi* (Dil-

lon) have been found in the Montane or Sonoran Desert regions of Southern Arizona, and only sixteen species range westward into California, the vast Mojave Desert acting as a formidable ecological barrier.

Although the above list is by no means thought to be conclusive, it appears that the Cerambycid fauna of the Hualapai Mountains is comprised primarily of southern Arizona Sonoran and Montane forms with the faunal elements of California and the Rocky Mountains exerting a minor influence. It also appears that the Hualapai Mountains represent the northern and western distributional limits of many of the species.

Acknowledgments

I wish to express my sincere appreciation to the following individuals whose help enabled this paper to be completed. Dr. Charles Hogue, Julian Donohue and Roy Snelling, Department of Entomology, Los Angeles County Museum of Natural History for encouragement and for supplying the necessary references from their library; Bob Gustafson, Department of Botany, Los Angeles County Museum of Natural History for some plant identifications; Ed Giesbert for his collecting data from the Hualapais; Frank Hovore for this collecting data and for reviewing the manuscript, and for offering the numerous incorporated suggestions; and especially to my wife Dee for her perseverance and accompaniment during twelve years of field collecting.

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PAN-PACIFIC ENTOMOLOGIST
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NEW SPECIES OF *HELICOPSYCHE* (TRICHOPTERA, HELICOPSYCHIDAE)[1]

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Members of the genus are worldwide in distribution with the majority of species in the subtropical and tropical regions. Of the approximate 60 species which have been described, only 4 species are known from North America north of Mexico: *borealis, mexicana, piroa* and *limnella*. It is probable that several northern Mexican species will be taken in portions of Arizona, New Mexico and Texas. The well known larvae may be found in clear, well aerated streams and congregates of 100 or more prepupae and pupae may occasionally be found. In the females the bursa copulatrix presents specific characters which should be illustrated when associated with the male. In the males those species that have no mesal lobe on sternum 6 are rare; in contrast, the presence of a mesal lobe in described females is rare. Future descriptions should record the presence or absence of this structure. In this paper five new species are described, one from southern California and four from Mexico and Central America. Length is given from head to tip of the wings. Deposition of types is indicated under each species.

Helicopsyche lewalleni, new species

Resemblance to *piroa* Ross, *vergelana* Ross and *tapada* Denning is apparent in the contour of the clasper and its mesobasal lobe. The species belongs to the group in which the females possess a mesal lobe on sternum 6. Diagnostic characters: claspers with base long, narrow, mesobasal lobe slender; phallus long and arcuate.

Male.—Length 6 mm. Antennal scape slightly longer than next three segments. Spurs 2-2-4, prominent, setose (in *vergelana* spurs are 1-2-4). Cerci small, ovate. Mesh-like reticulation present on sterna 3, 4; cephalic and caudal margins of sternum 6 dark brown, left pleuron with minute ovate translucent area along brown pigmented line; mesal lobe (Fig. 1A) lightly pigmented, elongate, length exceeds width of segment. Cephalic margins terga 5–9 dark brown, mesal excision broad, shallow. Genitalia as in Fig. 1. Sternum 9 narrow, bifurcated brown lateral apodeme indicates margin of

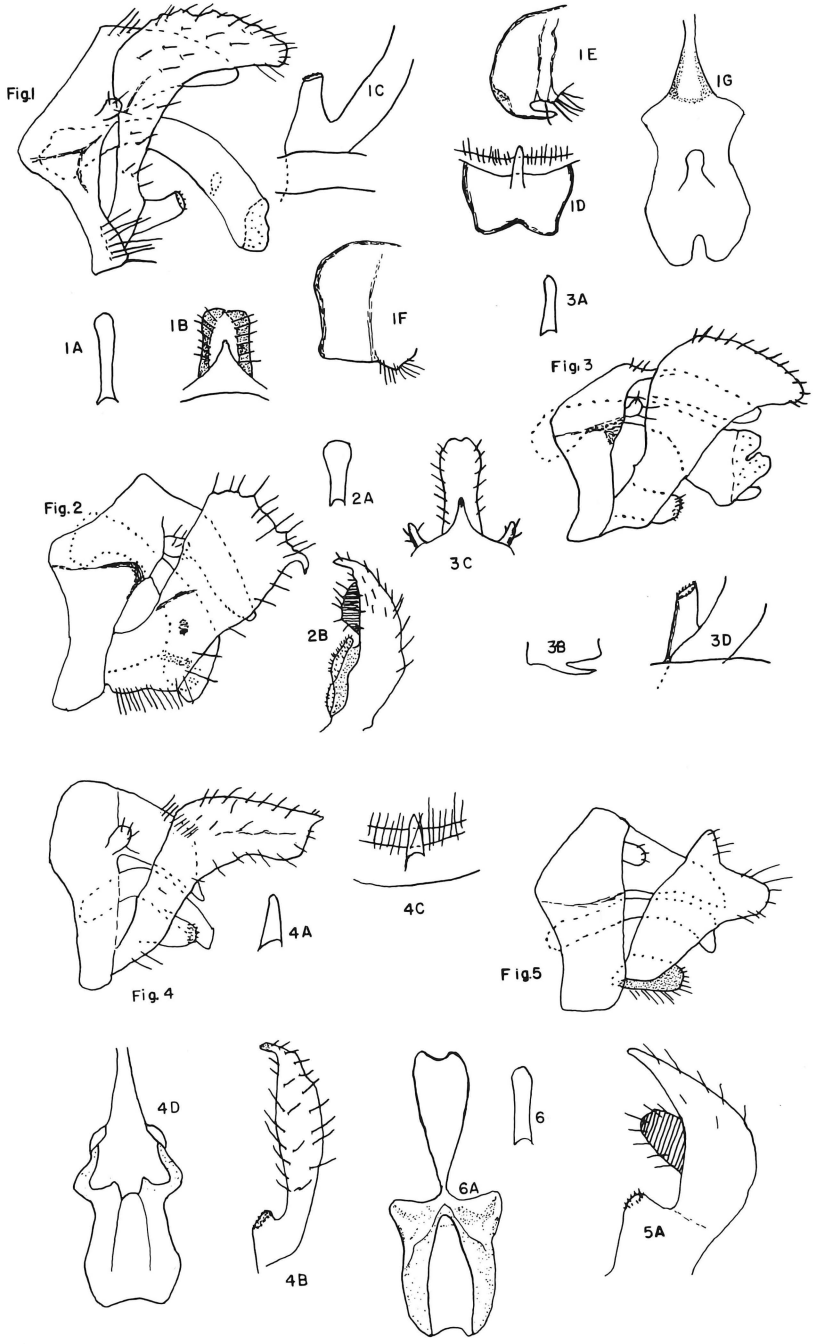
Fig.1
1C
1E
1G
1D
1F
3A
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Fig. 3
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Fig. 2
2B
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3D
4C
4A
Fig. 4
Fig. 5
4D
4B
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6A
5A

tergum 9; dorsal margin tergum 9 projected caudad (Fig. 1B). Tergum 10 convex from dorsal aspect, lateral margins parallel, row of erect setae present on dorsolateral margins, apex minutely emarginate in holotype, not in paratype. Clasper base elongate, dorsal margin crenulated, arcuate, apex obtuse; mesobasal lobe, ventral aspect (Fig. 1C), long, truncate apex bearing dense, brownish spicules, apex and mesal margins dark brown. Phallus curved ventrocaudad, phallobase enlarged, apex only slightly enlarged, distal margin semimembranous; viewed laterally a brown pigmented internal sclerite discernible (Fig. 1); phallus normally reposes in concave tergum 10.

Female.—Length 6 mm. General color and structure similar to male. Mesh-like reticulation present on most of sterna 3–4, sterna 3–6 densely setose; cephalic margins sterna 3, 4 dark brown; sternum 5 brown, margins dark brown; sternum 6 cephalic margin brown, narrow excision, mesal lobe subacute, projected beyond margin (Fig. 1D); from lateral aspect (Fig. 1E) mesal lobe directed caudad, acuminate; sternum 9 cephalic margin dark brown; tergum 7 cephalic margin with deep narrow excision. Lateral aspect, sterna 3–6 caudal margin produced ventrad, dense setation (Fig. 1F). Bursa copulatrix from ventral aspect as in Fig. 1G.

Holotype.—Male, El Salvador: La Liberatad, light trap, west bank Rio Chilama, 20 February 1969, Larry L. Lewallen. Allotype. Female (damaged), same data as for holotype. Paratype. Male, same data as for holotype.

Types to be deposited in Academy of Sciences, Golden Gate Park, San Francisco, California.

This species named in honor of the collector, Larry L. Lewallen, State Department of Health, Fresno, California.

Helicopsyche villegasi, new species

Related to *planata* Ross, differing from it and others as follows: sharply curved apex of claspers directed ventral, narrow mesobasal lobe of clasper; sharply declivent tergum 10; distally enlarged phallus.

←

Figs. 1–6. Fig. 1. *Helicopsyche lewalleni,* male genitalia, lateral. 1A, mesal lobe sternum 6, ventral aspect; 1B, tergum 9, 10, dorsal aspect; 1C, clasper mesobasal lobe, ventral view; 1D, female, sternum 6, ventral aspect; 1E, female, sternum 6, lateral view; 1F, female, sternum 5, lateral; 1G, bursa copulatrix, ventral. Fig. 2. *Helicopsyche villegasi,* male genitalia, lateral; 2A mesal lobe sternum 6, ventral; 2B, clasper, mesobasal lobe, ventral. Fig. 3. *Helicopsyche temora,* male genitalia, lateral; 3A mesal lobe sternum 6, ventral; 3B, mesal lobe sternum 6, lateral; 3C, tergum 10, dorsal; 3D, clasper, mesobasal lobe, ventral. Fig. 4. *Helicopsyche rentzi,* male genitalia, lateral. 4A, mesal lobe sternum 6; 4B, clasper, mesobasal lobe, ventral; 4C female, sternum 6, ventral; 4D, female, bursa copulatrix, ventral. Fig. 5. *Helicopsyche sinuata,* male genitalia, lateral; 5A, clasper, mesobasal lobe, ventral. Fig. 6. *Helicopsyche mexicana,* male, mesal lobe, sternum 6, ventral; 6A, female, bursa copulatrix, ventral.

Male.—Length 8 mm. General color ochraceous. Antennal scape slender, equal in length to next 5 segments. Sterna 3, 4 with mesh-like reticulation; sternum 6 mesal lobe clavate, length approximately three-quarters width of segment, luteous (Fig. 2A). Terga 2–9 cephalic and lateral margins dark brown, mesal excisions shallow; tergum 8 heavily pigmented. Genitalia Fig. 2. Sternum 9 gradually widened to the brown pigmented lateral apodeme; cephalic margin tergum 9 oblique, dorsal margin declivent. Cerci small, ovate. Tergum 10 projecting ventrad; distinct inverted brownish Y-shaped line on dorsum; distal margin oblique. Clasper dorsal margin serrate, acute apex curved ventrad; mesobasal lobe extends caudad slightly beyond margin; from ventral aspect (Fig. 2B), mesobasal lobe narrow, apex arcuate and bearing dark brown spicules, mesal margin brownish. Phallobase enlarged, median portion narrow and cylindrical, apex large, curved ventrad.

Holotype.—Male, Mexico; 4 km W of Nochistlan, Zacatecuas, 22–23 September 1975, 1930 m, Rio de Nochistlan, at dam named Presade, "Los Tuzas," Baldomera Villegas.

Type deposited in Entomology Department, University of California, Davis, California.

This species named in honor of Mr. Baldomera Villegas, University of California at Davis who collected this interesting specimen.

Helicopsyche temora, new species

This species belongs to the *selanderi* Ross, *tapadas* Denning complex. Diagnostic characters: clasper with lateral and dorsal margin broadly rounded, apex obtuse; oblique apex of mesobasal lobe of clasper; apex of ventrad curved phallus greatly enlarged.

Male.—Length 5.5 mm. General color luteous. Sterna 3, 4 with mesh-like reticulation. Terga 2–6 subquadrate, cephalic margins dark brown, wide shallow excisions. Antennal scape enlarged, curved dorsocaudad, length equal to next 4 segments. Mesal lobe sternum 6 yellowish, elongate, about two thirds width of segment from ventral aspect (Fig. 3A), acuminate from lateral aspect (Fig. 3B). Genitalia Fig. 3. Sternum 9 narrow, cephalic margin somewhat convex, tergal margin indicated by brown lateral apodeme; tergum 9 narrowed dorsad, projected caudad. Cerci inconspicuous, ovate. Tergum 10 convex, lateral margins parallel, single row erect setae along lateral margins (Fig. 3C); from lateral view, tergum gradually narrowed to rounded apex (Fig. 3). Clasper mesal margin with short angulation, dorsal margin broadly arcuate, apex obtuse (subacute in one paratype). Mesobasal lobe about equal width throughout, apex oblique, spiculated; mesal and apical margins brown, ventral aspect (Fig. 3D). Phallus curved ventrad, apex enlarged, distal portion semimembranous (Fig. 3).

Holotype.—Male. Mexico: 6.4 km (4 mi) SW of Temoris, Chihuahua 1500

m (4900′), 6 August 1968, R. C. Gardner, C. S. Glaser, T. A. Sears. Paratypes. 2 males. Same data as for holotype.

Types deposited Entomology Department, University of California, Davis.

Helicopsyche rentzi, new species

This species bears little resemblance to other described species. Diagnostic characters: ventrad projected tergum 10; ventral angled phallus; straight dorsal margin of clasper; narrow mesobasal lobe of clasper.

Male.—Length 5 mm. General color luteous. Antennal scape equal in length to next 4 segments. Mesh-like reticulation on sterna 3, 4, 5 cephalic margins brown; terga cephalic margins brown, excisions wide, shallow. Mesal lobe on sternum 6 non-pigmented, about half width of segment (Fig. 4A). Genitalia, Fig. 4. Sternum 9 narrow, in absence of a pigmented lateral apodeme, demarcation of tergum 9 difficult to discern. Cerci small, elongate. Tergum 10 directed sharply ventrad, apex subacute; from dorsal view distal half not discernible due to sharp ventral angulation; the setose semicircular lateral area best viewed from lateral aspect. Clasper base narrow; greatly enlarged dorsal portion with ventral and dorsal margins subparallel; apex attenuated, subacute, black; a brown pigmented line discernible in cleared specimens on lateral surface (Fig. 4); from ventral aspect (Fig. 4B), mesal lobe narrow, apex obliquely truncate with dense, brown spicules. Phallus angled abruptly ventrad.

Female.—Length 5.5 mm. Color, general structure similar to male. Sterna 3, 4 with mesh-like reticulation; all cephalic margins of sternites dark brown. Sternum 6 with lightly pigmented subacute mesal lobe, about half width of segment; distal margin bearing dense brown setae (Fig. 4C). Sternum 8 with submarginal narrow band of dense dark brown setae; tergites deeply excised, cephalic margins dark brown, especially on terga 5, 6, 7, 8. Tergum 11, dorsal aspect, with elongate brownish lobes densely setate. Bursa copulatrix, ventral aspect, as in Fig. 4D.

Holotype.—Male, Costa Rica: Guanacosta, Finca La Pacifica, 10 miles north Canas, 10 February 1969. David C. Rentz. Allotype. Female. Same data as for holotype.

Type to be deposited in Academy of Sciences, Golden Gate Park, San Francisco, California.

Named in honor of Dr. David C. Rentz, who has collected many very interesting Trichoptera.

Helicopsyche sinuata, new species

This species is remarkably different from the four species known from North America north of Mexico. Diagnostic characters: phallus curved

slightly ventrad; large, wide mesobasal lobe and sinuous dorsal margin of clasper; mesal lobe of sternum 6 absent.

Male.—Length 4.5 mm. General color ochraceous. Spurs long, slender. Antennal scape short, robust, subequal to next 3 segments. Cerci ovate, dorsad of lateral apodeme. Sterna 3, 4, 5 with mesh-like reticulation; sternum 6 mesal lobe absent. Genitalia, Fig. 5. Sternum 9 practically same width throughout, lateral margin produced to obtuse angle. Tergum 10, lateral aspect (Fig. 5), narrowed distally, from dorsal aspect, apex minutely bilobate. Clasper gradually expanded dorsad from base, dorsal margin with antero-dorsal and postero-dorsal lobes, setation light; from ventral aspect (Fig. 5A), clasper curved mesad, apex acuminate and acute; from this view the postero-dorsal lobe is discernible. Phallus projected caudad slightly beyond tergum 10, curved gradually ventrad to subacute apex.

Holotype.—Male, California: San Bernardino County, Sheep Creek Canyon, 5 May 1950, A. L. Melander. Saul Frommer, Entomology Department, University of California, Riverside (pers. comm.) states; "Sheep Creek Road joins Hwy. 138 south of Phelan, Sheep Creek is west of the road."

Type to be deposited Entomology Department, University of California, Riverside.

Helicopsyche mexicana Banks

This species is widely distributed from Frijole, Texas (Ross, 1944) to southern Utah and California into Mexico. New records are: Washington County, Utah, Leeds Canyon, July 1964, W. J. Hanson (Utah State University); Los Angeles County, California, Graveyard Canyon, 9 May 1970, J. A. Honey (Los Angeles County Museum of Natural History).

Male.—Sterna 3, 4 with mesh-like reticulation; sternum 6 mesal lobe luteous, short (Fig. 6) usually about half the length of the sternite. The contour of the clasper, especially the dorsal margin, is quite variable.

Female.—Sternum 4, 5 with mesh-like reticulation. Caudal margins sterna 6, 7 with dense blackish setae. From ventral aspect, the darkly pigmented margin of the bursa copulatrix are discernible in cleared specimens, (Fig. 6A). This species is widely distributed in Arizona and is the dominant helicopsychid in that state.

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Footnote

[1] Published with the approval of the New Hampshire Agricultural Experiment Station as Scientific Contribution No. 837.

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SCIENTIFIC NOTE

A NOTE ON THE ANTHICIDAE OF KAUAI, HAWAII

During a 1976 visit to Kauai, the author and his wife noted on several occasions numbers of anthicids on the inner sides of shop windows and on adjacent walls. A small series of the animals was collected (2 mi SE Lihue; 27–28 November 1976; D. K. and J. T. Young) and subsequently determined to be *Stricticomus tobias* (Marseul) (specimens deposited in the collection of the author as well as that of the Bishop Museum in Honolulu). To the author's knowledge, this represents the first Hawaiian record of the cosmopolitan *tobias* outside Oahu, as well as the first anthicid to be recorded from the island of Kauai. A check through the collections of the Bishop Museum (conducted by G. A. Samuelson) and the Hawaii Department of Agriculture (conducted by S. Y. Higa) for additional unpublished records yielded but a single Kauaian anthicid, this having been identified as *A. floralis* (Linnaeus). Additionally, Dr. Samuelson was able to locate data cards on file at the Bishop Museum which listed *S. tobias, A. vexator* Werner, and *Thicanus annectens* (LeConte) from Kauai, though these records could not be confirmed by specimens. The *tobias* and *annectens* samples were recorded as having been taken in "salt marshes nr. sea level."

The association of *S. tobias* with shop display windows leads me to suggest that artificial lighting served as the stimulus for attraction, an idea supported by other collection records which list the species as having been taken from light trap samples (Werner, 1961, Psyche 68: 70–72; Werner, 1966, Proc. Hawaiian Ent. Soc. 19: 310–316). Extensive baiting with cantharidin, a positive stimulus for the attraction of numerous species of anthicids (Chandler, 1976, Pan-Pac. Ent. 52: 179–180; Young, unpublished notes) proved fruitless in several habitat types on Kauai.

The time and assistance of G. A. Samuelson and S. Y. Higa are gratefully acknowledged.

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NOTES ON THE GENUS *ZAOMMA* ASHMEAD, WITH A KEY TO SPECIES (HYMENOPTERA: ENCYRTIDAE)

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In conjunction with our collaborative studies of Nearctic Encyrtidae we had the opportunity to study the type-species of *Zaomma* Ashmead. Ashmead based this genus on *Encyrtus argentipes* Howard (type-locality St. Vincent, West Indies). Since the original description, the genus has remained monotypic and an enigma to many students of the Encyrtidae. Our study of *Zaomma argentipes* (Howard) has revealed the following new synonymy.

Zaomma Ashmead

Zaomma Ashmead, 1900. Proc. U.S. Natl. Mus. 22(1202): 340, 401. Type-species: *Encyrtus argentipes* Howard. Original Designation.

Apterencyrtus Ashmead, 1905. Canad. Entomol. 37(1): 5. NEW SYNONYMY. Type-species: *Apterencyrtus pulchricornis* Ashmead. Monotypic. (The type-species is considered a subjective junior synonym of *Chiloneurus microphagus* Mayr, 1876.)

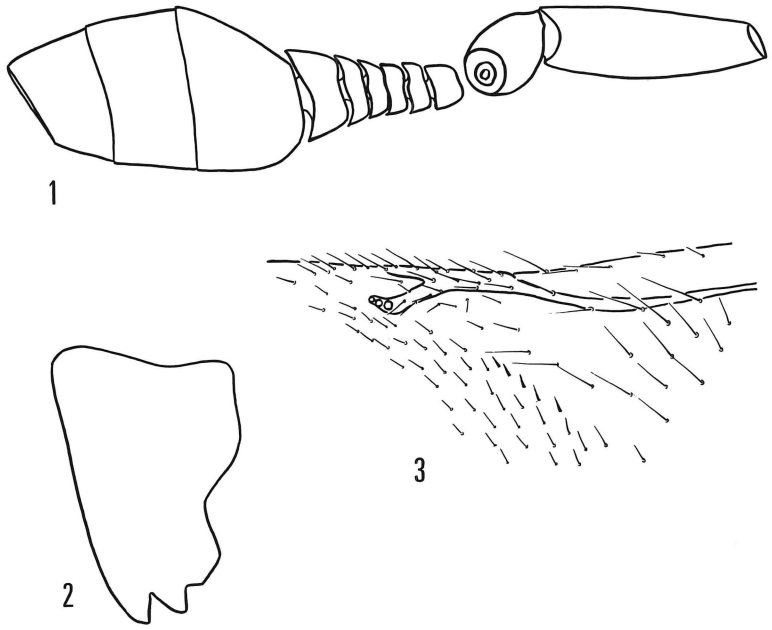
Metallonoidea Girault, 1915. Journ. N.Y. Entomol. Soc. 23(3): 169–170. NEW SYNONYMY. Type-species: *Metallonoidea brittanica* Girault. Monotypic.

Chiloneurinus Mercet, 1921. Fauna Iberica Himen. Fam. Encirtidos, p. 646. Type-species: *Chiloneurus microphagus* Mayr, 1876. Original Designation.

Metapterencyrtus Tachikawa, 1963. Mem. Ehime Univ., Sect. VI (Agric.) 9(1): 213–214. NEW SYNONYMY. Type-species: *Metapterencyrtus eriococci* Tachikawa. (The type-species is considered a subjective junior synonym of *Zaomma eriococci* (Ferrière). NEW SYNONYMY. Original Designation.

A Key to the Species of *Zaomma* (Females)

1. Middle tibia white or yellow, without dark ring. Tuft of setae on apex of scutellum not developed 2
   Middle tibia with dark ring near base or more or less dark with base and apex pale; tuft of setae on apex of scutellum frequently developed 4
2. Exserted portion of gonostylus at least 0.33 times as long as gaster. Legs including coxae brownish yellow. Scutellum flat. Antennal funicular segments 5–6 not transverse. Forewing not less than three times longer than its maximum width. U.S.S.R. (Kunashir Island, Kuriles) from *Antonina crawi* Cockerell (Pseudococcidae) on bamboo (*Sasa*) .... *Z. danzigae* (Pilipjuk and Trjapitzin) NEW COMBINATION[1]
   Exserted portion of gonostylus not longer than 0.25 of gaster. Coxae, femora, fore and hind tibiae more or less darkened. Scutellum convex. Antennal funicular segments 5–6 transverse, forewing length: width ratio variable 3
3. Apical 2–3 funicular segments white or yellow. Minimum width of vertex about 0.20 times maximum width of head (extreme 3:14). D.D.R.; Czechoslovakia; Hungary; U.S.S.R. (Zakarpatye Region, Moldavia, Kabardino-Balkaria, Transcaucasus, East-Kazakhstan Region, Yakutia, Primorye Territory, Sakhalin), Japan as secondary parasite of Eriococcidae .... *Z. eriococci* (Ferrière) NEW COMBINATION[2]
   All funicular segments dark. Minimum width of vertex about 0.25 maximum width of head. U.S.S.R. (Kunashir Island, Kuriles) from *Acanthococcus sasae* Danzig (Eriococcidae) on *Sasa* (dwarf bamboo) ..... . *Z. acanthococci* (Pilipjuk and Trjapitzin) NEW COMBINATION[3]
4. Funicular segments 5–6 somewhat wider than long, rarely quadrate or a little longer than wide; club more than 2 times longer than wide. Scutellum with a well-developed tuft of long, dark setae on apex 5
   Funicular segments 5–6 twice as wide as long; club less than two times longer than wide (Fig. 1). Scutellum without a tuft of long, dark setae on apex 6
5. Funicular segments 5–6 white, quadrate, or slightly transverse. Posterior half of mesoscutum with dense, silvery pubescence. Gaster usually as long as thorax; apical angle of syntergum obtuse. Cosmopolitan as secondary parasite of Diaspididae. .... *Z. lambinus* (Walker) NEW COMBINATION[4]
   Funicular segments 5–6 brownish-black, a little longer than wide.



Figs. 1–3. Fig. 1. Female antenna of *Zaomma argentipes* (Howard) (reconstructed) (×140). Fig. 2. Female mandible of *Z. argentipes* (×300). Fig. 3. Female forewing venation of *Z. argentipes* (×140).

Posterior half of mesoscutum with sparse silvery pubescence. Gaster as long as head and thorax combined; apical portion of syntergum acute. U.S.S.R. (Primorye Territory) .... *Z. abas* (Trjapitzin) NEW COMBINATION[5]

6. Antennal club truncation small, only a little more than 0.33 times as long as ventral surface of club; septa dividing segments of club almost transverse (Fig. 1). Frontovertex noticeably less than 0.33 times maximal head width. Marginal vein of forewing somewhat longer than stigmal vein (Fig. 3). Middle tibia yellowish white, with dark ring near the base. All funicular segments white. West Indies (St. Vincent) ..... *Z. argentipes* (Howard)[6]

Antennal club truncation large, noticeably more than the length of ventral side of club; septa dividing segments of club oblique. Frontovertex about 0.33 times the maximal width of head. Marginal vein of forewing not longer than stigmal vein. Middle tibia more or less brown, with base and apex pale. Funicular segments 1–2 more or less brown, 3–6 ivory yellow. Senegal .... *Z. ceroplastae* (Risbec) NEW COMBINATION[7]

The use of the name *Zaomma* instead of *Apterencyrtus* may disturb some encyrtid taxonomists and biological control specialists. *Apterencyrtus* has been widely used in the literature and is well represented in the Palearctic Region. However, the name *Zaomma* has not gone unused. Timberlake (1924) discussed it in his description of *Synaspidia* and provided additional descriptive notes. The International Commission should be consulted if workers believe that the use of *Zaomma* would cause instability of nomenclature.

The morphological characters used to identify this genus are similar to those of *Apterencyrtus* and *Metapterencyrtus*. We regard *Zaomma* as a member of the Cheiloneurini Hoffer as that tribe was characterized by Trjapitzin (1973). This tribe is composed of primary and secondary parasites of scale insects.

Species Previously Assigned to *Apterencyrtus*

1. *Apterencyrtus adeli* Traboulsi. Traboulsi (1968) provided a comprehensive diagnosis of this species and compared it to *Apterencyrtus microphagus, Apterencyrtus thomsoniscae* Alam, and *A. zonatus* Alam. Study of Traboulsi's description and illustrations shows that this species is conspecific with *Z. lambinus* (Walker).

Graham (1969) synonymized *A. thomsoniscae* and *A. zonatus* with *Encyrtus lambinus* Walker. *Encyrtus laminus* is considered valid because *lambinus* was an unused name. In this paper, we are using the name *lambinus*. The matter should be brought to the attention of the Commission of Zoological Nomenclature.

2. *Apterencyrtus africanus* Risbec. Annecke and Insley (1971) have cataloged the Ethiopian Encyrtidae and Aphelinidae. In that catalog they note that this species was misplaced in *Apterencyrtus*. Annecke and Mynhardt (1973) regard this species as a member of *Exoristobia* Ashmead and we agree.

3. *Apterencyrtus trichomasthoides* Hoffer. We regard this species as a member of *Metablastothrix* Sugonyayev NEW COMBINATION. Through the courtesy of Dr. A. Hoffer of Prague, V. A. Trjapitzin has studied a paratype female of this species. It is probably a synonym of *M. truncatipennis* (Ferrière).

Zaomma argentipes (Howard)

This species was originally described by Howard (1894a) on the basis of a single female specimen taken at St. Vincent, West Indies. Subsequently Girault removed a forewing and the head and mounted them in Canada balsam. The head was smashed and fragmented. Thus it is not possible to give a comprehensive description. We have reconstructed the antenna (Fig.

1), illustrate the mandible (Fig. 2), and illustrate key taxonomic characters of the forewing (Fig. 3).

The original description is generally accurate. In addition to the characters given in the key, the following characters may prove helpful in the identification of this species.

Pronotum, when viewed from dorsal aspect, short; posterior margin moderately concave; surface with rather bold, raised reticulate sculpture; mesoscutum about 1.8 times wider than long, broadly and convexly rounded from side to side, surface with sculpture as pronotum; axillae just meeting medially, with raised reticulate sculpture less pronounced; scutellum about as long as medial length of mesoscutum, robust, convexly rounded from side to side, surface, deeply, narrowly, convexly rounded, and extending to propodeum. Propodeal characters obscured by hindwing glued over metasomal terga.

Metasoma somewhat lanceolate, about as long as mesosoma; paratergite apparently absent; gonostylus slightly exserted.

U.S.N.M. Type number 2723.

Acknowledgments

This report stems from a binational scientific exchange agreement. We thank the National Academy of Science (U.S.A.) and Soviet Academy of Sciences (U.S.S.R.) for making our collaborative research efforts possible. Gordon Gordh would like to thank the U.S. Department of Agriculture for a leave of absence so that this work could be performed and the Zoological Institute of the Soviet Academy of Sciences (Leningrad) for generously providing space and facilities used during the tenure of our studies.

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Footnotes

[1] Philipjuk and Trjapitzin, 1974: 1891 (*Apterencyrtus*).

[2] Ferrière, 1955: 117–118 (*Apterencyrtus*); Hoffer, 1957: 351–352 (*Apterencyrtus*); Erös, 1961: 418 (*T. niveicrus*); Tshumakova, 1961: 335–337 (*Apterencyrtus*); Tachikawa, 1963: 214–215 (*Metapterencyrtus eriococci* Tachikawa nec Ferrière); Erdös, 1964: 179, 180 (*Trichomasthus niveicrus*).

[3] Philipjuk and Trjapitzin, 1974: 1890 (*Apterencyrtus*).

[4] Walker, 1838: 422 (*Encyrtus*); Walker, 1844: 184 (*E. euryclea*); Mayr, 1876: 745, 746 (*Chiloneurus microphagus*); Ashmead, 1905: 5 (*Apterencyrtus pulchricornis*); Girault, 1915a: 282–284. (*Aphidencyrtus aspidioti*); Girault, 1915b: 169–170 (*Metallonoidea brittanica*); Ruschka, 1915: 403–404 (*Habrolepis mayri*); Mercet, 1921: 647–648 (*Chiloneurinus microphagus*); Nikol'skaya, 1952: 460 (*Chiloneurinus microphagus*); Alam, 1957: 439–441 (*Apterencyrtus thomosoniscae*); Alam, 1957: 438–439, 441 (*A. zonatus*); Hoffer, 1957: 350–351 (*A. microphagus*); Tachikawa, 1963: 119–121 (*A. microphagus*); DeSantis, 1963: 361–364 (*A. microphagus*); Peck, 1963: 441–443 (bibliography); Erdös, 1964: 301–302 (*A. microphagus*); Traboulsi, 1968: 348–354 (*A. adeli*); Graham, 1969: 270–271 (*Apterencyrtus*) (synonymy); Hayat et al., 1974: 57–60 (*A. microphagus*); Bouček, 1977: 151–152.

[5] Trjapitzin, 1967: 183; 213–214.

[6] Howard, 1894a: 95 (*Encyrtus*); Timberlake, 1924: 397–399.

[7] Risbec, 1954: 1061–1074 (*Apterencyrtus*); Annecke and Mynhardt, 1973: 217 (*Apterencyrtus*).

PAN-PACIFIC ENTOMOLOGIST
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STUDIES OF DASYTIDAE NO. 1: NEW SPECIES OF *PRISTOCELIS* (COLEOPTERA)

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The family Dasytidae is among the ten largest families of Coleoptera in the United States. It is especially prominent in the arid or semi-arid regions west of the 100th meridian, where almost all of the 325 American species occur.

Many undescribed species are present in my collections. A number of these are in the genus *Pristocelis* LeConte, only two of which have been collected in large enough numbers in one locale to justify their recognition as a population of a stable species.

Pristocelis irwini, new species
(Fig. 1)

Size and shape.—Range, from 2.6 to 3.6 mm long, parallel-sided, about 2.5 times longer than wide. Females averaging smaller and less elongate than males.

Color.—Pitch black head, thorax, scutellum, triangular area at base of elytra, and sometimes extending along the midline of the elytra. Dull pale testaceous on remainder of elytra. Mouth parts and antennae black, with reddish tinge, darker than legs which are testaceous with reddish and blackish tints. In males, abdominal sternae are all black; in females, the anterior segments are black but a variable number of terminal ones are pale testaceous.

Pubescence.—Covered with fairly dense short decumbent and semidecumbent pale hairs. No erect flying hairs. Lateral fimbriae of pronotum and elytra, composed of longer whitish slightly curved hairs, irregular in orientation. Ventral abdominal hairs are snow white, coarser and more dense, obscuring the surface.

Head.—The head appears large, the occipito-temporal region broad and elongate. Mandibles, stout. These two features are definitive for males of this genus, but are absent in females. Between the antennal sockets in both sexes in this species is a conspicuous slightly arched cord-like ridge, designated the frontal cord. It bears no relation to the retraction of the labrum, and is more rugged in males than in females. The eyes are prominent, less bulging in males than in females.

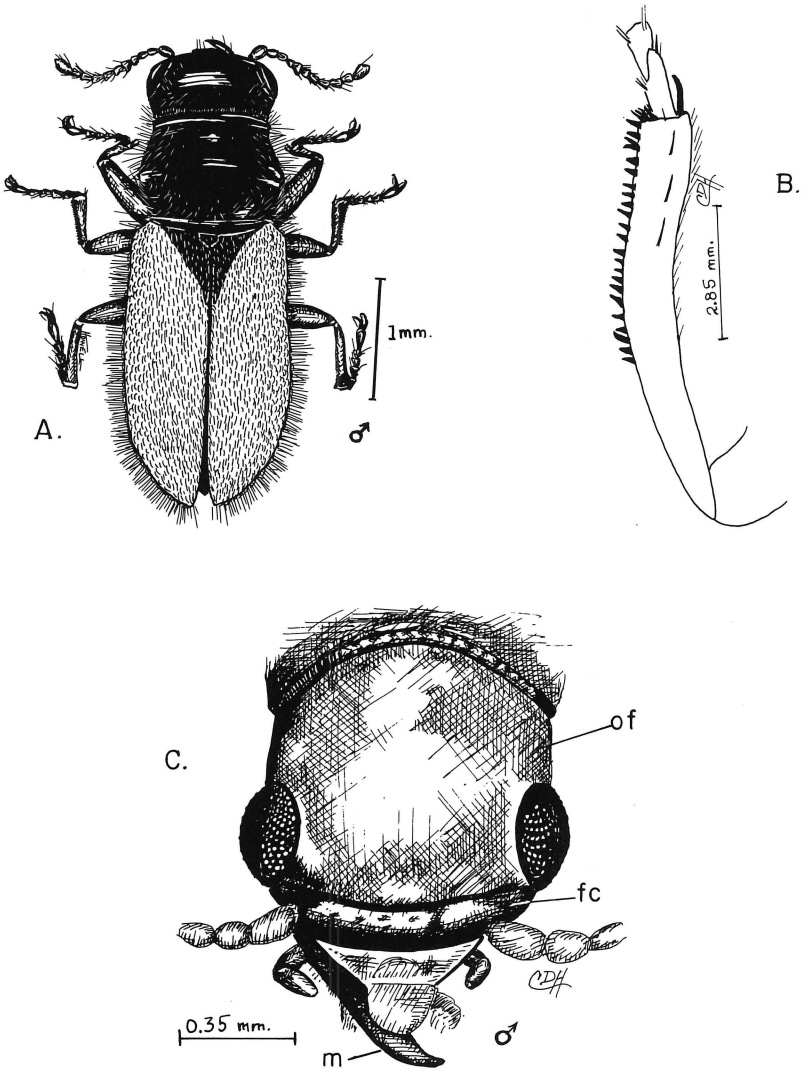

Fig. 1. A. Dorsal aspect of *Pristocelis irwini* new species, male. B. Protibia of *P. irwini* showing the comb of stout spinules on the outer posterior border. C. Head of *P. irwini,* male, showing elongated occipito-temporal area (ot), mandible (m), and frontal cord (fc).

Thorax.—Pronotum is large, transverse, oval, almost as wide just past the middle as the elytra at the humeri. At the widest point the lateral margins, from above, curve abruptly. Lateral margins are minutely serrulate.

Legs.—Protibiae expand abruptly from the delicate base, are slightly

curved, somewhat compressed, bearing in both sexes a striking single-file comb of 18 to 25 blackish stout spinules on their outer posterior borders. The tarsi have slender claws, dilated at the base, with slender ungual appendages the full length of the claws.

Elytra.—Humeri are moderately prominent, the contour posterior to them slightly narrowed and depressed dorsally, then gracefully curving, wider behind the middle, the lateral edges only slightly recurved. Epipleurae are broad, parallel briefly, then abruptly narrowing, extruded to the bend of the elytra.

The collection was made in November 1963 by Michael E. Irwin from flowers of *Palofoxia* and *Stephanomeria*. Thirty-seven specimens were collected south of Palm Springs, Riverside County, California; 19 in Coyote Canyon and 18 in Deep Canyon. I am pleased to name the species after Dr. Irwin for his numerous kindnesses to me in the past. The collection bears my numbers 2470–2506.

Holotype.—Male, No. 2476, from Deep Canyon. Allotype: No. 2482, from Deep Canyon. Paratypes: 16 males and 19 females.

The holotype and allotype are designated to be deposited in the type collection of the California Academy of Sciences. Duplicates are designated for the University of California collections in Riverside and Berkeley.

Pristocelis volki, new species

Size and shape.—The range from 2.1 to 2.7 mm length makes this the smallest species of *Pristocelis*. Sexes overlap in size, but the largest are females, and the smallest are males, thus reversing the sexual dimorphism from that of other *Pristocelis*. Bodies, parallel-sided, slender, about 2.5 times longer than wide. In males the pronotum is much larger than in females.

Color.—In males, head pitch black, the color varying in its extent onto the face which is rufo-testaceous with black mandibles. Antennae, varying from pale amber at base to rufo-testaceous distally. Pronotum, with variable black, limited to a central spot, or a median line, or spreading, with testaceous lateral and sometimes anterior borders. Elytra, in both sexes, black with testaceous tips, the yellow variable in its forward extension.

In females, the head is variable from ruddy to yellow testaceous, lacking a black occiput. Pronotum, the same as in the male except for one specimen which is all bright testaceous.

The ventral sterna and legs are bright yellow-testaceous in both sexes.

Pubescence.—The body is covered with one kind of fairly dense, closely decumbent short creamy-white hairs. Pronotal fringes of irregular longer slender hairs. Elytral fringes not distinctive from hairs on the back. Ventral

hairs are dense clinging creamy-white hairs. In males the sexual segment is bracketed by conspicuous tufts of many long, straight, black hairs.

Head.—Large in males due to elongated occipito-temporal region. Eyes, slightly oval, bulging more in females than males. No frontal cord. Labrum, small and semicircular. Mandibles, large and stout, especially in males. Antennae, long in males, shorter in females, bristling with short blunt hairs.

Thorax.—Pronotum, transverse, widest about the middle. Apical border straight in females, more sinuate in males. Apical angles are impressed, basal angles lost in the even curvature sweeping from the widest part around the base. Lateral borders are minutely serrulate.

Legs.—Protibiae, somewhat wedge-shaped, with two slender distal spurs almost concealed by the long slender dark hairs on the anterior apical border. Comparable hairs on the meso- and metatibiae are even more prominent. A few (3–8) dark, stout spinules are scattered on the outer posterior borders of the pro- and mesotibiae. Slender tarsal claws with a basal dilation and appendages as long as the claws.

Elytra.—Slightly constricted and depressed behind the humeri, widest behind the middle. Epipleura are broad at base, narrowing abruptly, and disappearing at the bend of the elytra.

Ventral abdomen.—A sixth sternum is visible in both sexes. In males, it is centrally impressed and bracketed with tufts of long black hairs.

Fourteen specimens, bearing my numbers 1293 and 1314–1326, were collected by the author on flowers of *Eriogonum* east of Lake Elsinore, Riverside County, California, June 6, 1969. I am pleased to name this species after my wife who has been an invaluable assistant and constant companion on many happy collecting trips.

Holotype.—Male, No. 1293, Allotype: female, No. 1319. Paratypes: 5 males and 7 females with the same data.

The holotype and allotype are designated for deposit in the California Academy of Sciences type collection of insects. Duplicates are designated for the collections in the Departments of Entomology of the University of California at Riverside and at Berkeley.

Irwini and *volki* are similar in having bright testaceous color in part of the dorsal aspect, and in having similar epipleura—wide basally and tapering abruptly before the abdomen, then gradually to the end. *Grandiceps* and *vandykei* are similar in having the central bodies all dark (except for the terminal ventral abdominal sternum, possibly in females of *vandykei*) and in having similar epipleurae—wider basally, and tapering gradually to the end.

Irwini, grandiceps and *volki* are striking species. *Vandykei* is more difficult to identify as it lacks outstanding features possessed by the other three. *Irwini* has at least three prominent unique features: the pronounced frontal cord, the pale testaceous elytra with a dark triangular basal spot,

and the striking single file row of numerous stout spinules on the outer posterior border of the pro- and mesotibiae.

Grandiceps is outstanding for its dual pubescence with long erect black hairs. *Volki* is very small, and also has striking coloration. Its dark elytra with pale apices, and pronotum with at least testaceous borders and sometimes all testaceous, simplify its identification.

Key to Species in *Pristocelis*

1. Body length over 3 mm 2
   Body length averages under 2.7 mm ..... *volki* new species
2. Body uniformly dark colored, lacking contrasting pale areas dorsally 3
   Pronotum and/or elytra with pale areas on dorsal side 4
3. Dual pubescence, with long erect black hair ..... *grandiceps* LeConte[2]
   One type of pubescence, more or less recumbent ..... *vandykei* Blaisdell[1]
4. Elytra pale, with dark triangular configuration at their bases; protibial comb of 18–25 stout dark spinules ..... *irwini* new species
   Elytra dark with pale tip; pronotum with pale sides at least ..... *volki* new species

Footnotes

[1] Blaisdell, Frank E., Sr. 1924. Studies in the Melyridae (Coleoptera) III. Pan-Pac. Ent. I. 15–16.

[2] Casey, Thomas. 1895. Coleopterological Notices, VI. Ann. N.Y. Acad. Sci. VIII: 459–460.

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A NEW SPECIES OF *STRIDULIVELIA* FROM MEXICO, AND A NEW SUBGENUS FROM MIDDLE AMERICA (HEMIPTERA: VELIIDAE)[1]

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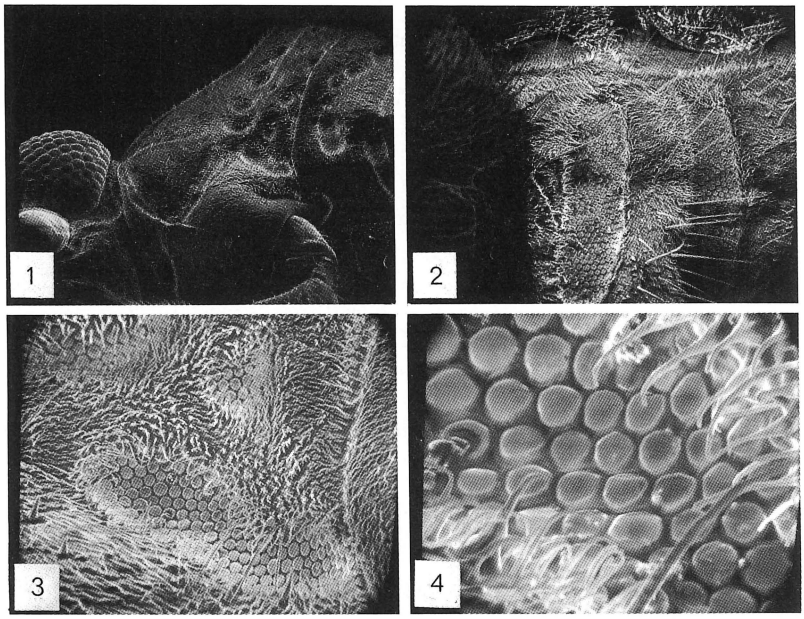
Hungerford (1929) proposed the new genus *Stridulivelia* (as a subgenus of *Velia*) to hold five new species of water striders from South America and one species from Middle America. The South American species all possess stridulatory mechanisms, but *cinctipes* (Champion), the Middle American species does not. Since then Drake and Harris (1938, 1941), Drake (1951, 1957) and Drake and Menke (1962) have added six more species. Another new species is described below.

I have examined all known species of *Stridulivelia*. Without exception they have numerous depressed hair-free round or elongate regions on various parts of the thorax and abdomen and on the jugum of the head (see Fig. 1; also see plates 1 and 2 in Drake and Menke, 1962). These depressed areas contain numerous round flat-topped pegs in a rather regular array (Figs. 2–4). The function of these structures is not known; thin sections examined under high magnifications (optical microscope) did not reveal any significant innervation (Polhemus and Moran, unpublished), so a hypothesized function as sound or electromagnetic receptors is refuted. No other group of veliids possess these depressed areas in a similar arrangement on the body, therefore Polhemus (1976) proposed that *Stridulivelia* be given generic rank.

Drake and Menke (1962) reviewed the Middle American and West Indian species of *Stridulivelia*. They pointed out that all Middle American species lack stridulatory structures. The West Indian species treated, *tersa* Drake and Harris from Trinidad, has a stridulatory mechanism, but Trinidad is zoogeographically part of South America. All South American species possess stridulatory structures. Drake and Menke apparently did not notice that the middle tarsi of all Middle American species have blade-like claws and the down-curving arolium is shaped like a blade (Fig. 5), whereas all South American species have slender claws and slender arolia. These differences and the vicariance pattern indicate an independent development of these two faunal groups, therefore I propose Aenictovelia **new subgenus** [*Ainiktos,* Gr., enigmatic, and *Velia*; feminine] to hold the four Middle American species, i.e., *cinctipes* (Champion), *expeixis* Drake and Menke, *pueblana* Drake, and *secerna* new species and type of the subgenus.

All specimens of the new species described below are in the Polhemus



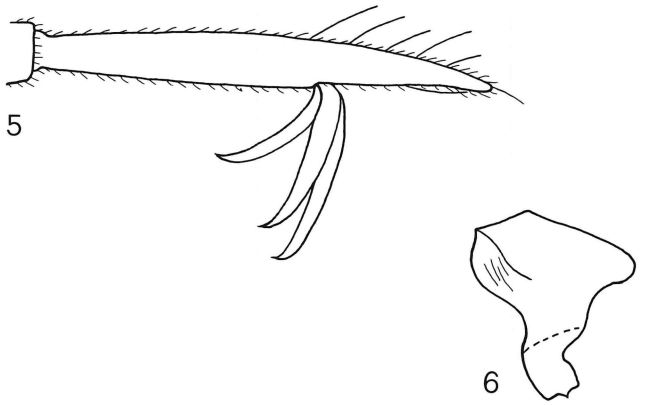
Figs. 1–4. *Stridulivelia (Aenictovelia) secerna* n. sp. Fig. 1. Thorax and head, showing depressed areas; Fig. 2. Depressed areas on abdomen (×190); Fig. 3. Depressed area (×490); Fig. 4. Pegs in depressed area (×1950).

collection. The holotype is irrevocably commited to later placement in a designated type repository. Paratypes will be distributed to various institutions.

Stridulivelia (Aenictovelia) secerna, new species

Macropterous male.—Elongate, brown; two wedge-shaped patches of silvery hairs anterolaterally on pronotom (1 + 1), and two similar elongate patches (2 + 2) laterally on each hemelytron. Legs, antennae, connexiva, lateral margins of pronotum and eyes, margins of coxal cavities yellow brown to orange brown. Dorsum covered with fine recumbent golden pubescence, sparser on head, absent on hemelytra except basally and laterally. Thoracic pleura almost immaculate; thoracic sterna and abdomen laterally beneath a row of deep pits, pruinose. Sterna of abdomen with coarse yellow pubescence, segments 5–7 shining medially.

Head with glabrous median furrow terminating posteriorly between two crescent shaped furrows (1 + 1) mesad of eyes. Width of eye/interocular



Figs. 5–6. *Stridulivelia (Aenictovelia) secerna* n. sp. Fig. 5. Tarsal segment III; Fig. 6. Male paramere.

space, 16/20 (60 units = 1 mm). Head length, 26. Rostrum reaching midway between anterior and middle coxae.

Pronotum length, 103; width across humeral angles, 97; slightly carinate on mid-line; coarsely pitted caudad of silvery patches, pits deep on margins and transverse row behind silvery patches, shallow on disc.

Abdomen long (166 caudad of posterior median angle of pronotum); width 67 at middle. Connexival spines short, barely produced. Seventh sternum tumid posteromedially, tumescence abruptly truncate and excavate posteriorly; sterna II and III distinctly carinate on median longitudinal line; pleura II–IV of male, II and III of female each with a median vertical furrow on both sides, and sometimes a small depressed spot on tergite V of male and IV of female. Genital segments long (47), set with long hairs. Male paramere as shown in Figure 6.

Antenna moderately long, stout, clothed with short recumbent pubescence, and longer setae ventrally on segments II–III; segment IV with scattered long setae; segment I curved, segment IV subfusiform; proportions I–IV, 57:44:37:32. Fore tibia with distal comb, also an adjacent black pad ventrally; middle tibia with distal comb; posterior tibia with blunt apical spur. Femora and middle tibia with rather evenly spaced long setae ventrally, 10–14 per leg segment; tibia thickly set dorsally with long semi-recumbent setae, hind femora and tibia clothed with such setae. Legs unarmed except posterior femur armed beneath with about 8 small black spines before middle, one larger black spine beyond middle (at 0.6 toward distal end) followed by 9 or 10 small spines decreasing in size distally; anterior to the latter is an irregular row of 7 similar spines. Posterior femur dark brown

ventrally, broadly annulated with dark brown beyond middle, dark on distal one-fourth. Measurements of legs:

	Femur	Tibia	Tarsal 1	Tarsal 2	Tarsal 3
Anterior	77	73	2	3	9
Middle	117	123	2	36	39
Posterior	113	112	3	25	25

Length, 4.75 mm, width (across humeral angles), 1.6 mm.

Macropterous female.—Very similar to male except legs and antennae lighter colored. Armature of posterior femur less pronounced; 3–4 small basal black spines, one slightly larger spine past middle and 5–6 smaller spines beyond; anterior row consisting of 8–10 small black spines reaching from basal one-third to distal end.

Length 4.65 mm, width 1.6 mm.

Material examined.—MEXICO: Holotype, macropterous ♂, and allotype, macropterous ♀, Chiapas, 11.2 km (7 mi) N of Arriaga, CL1246, XII-18-1969, J. T. Polhemus. Paratypes as follows: Chiapas, about 600 macropterous ♂♂ and ♀♀, same data as holotype; 1 macropterous ♂, Veracruz, 12.8 km (8 mi) NE Tlapacoyan, VII-16-1969, A. S. Menke (paratype of *Velia phriatra* Drake and Menke; manuscript name); 120 macropterous ♂♂ and ♀♀, Chiapas, W of Rizo de Oro, CL1331, I-14-1970, J. T. Polhemus.

This species is closest to *pueblana* Drake and *epeixis* Drake and Menke. In the Drake and Menke key, the males of *secerna* will key to *pueblana* and the females to *epeixis* on the basis of the vertical furrows on the abdominal pleura. The whitish last antennal segment given as a key character by Drake and Menke is not consistently diagnostic, because some specimens of all four species of the subgenus *Aenictovelia* have the last antennal segment yellow brown to whitish.

The tumid and posteriorly truncate male seventh abdominal sternum of *secerna* immediately separates it from all other species of the subgenus. Also, in *secerna* the metasternum in side view is highest medially, sloping posteriorly, whereas in the other three species the metasternum is highest at the posterior margin and is truncate posteriorly.

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Footnote

[1] Contribution from the University of Colorado Museum, Boulder, CO 80309 and the Martin Marietta Corporation, Denver, CO 80201.

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SCIENTIFIC NOTE

LECTOTYPE DESIGNATION FOR *FRANKLINIELLA TRITICI CLARA* MOULTON

This taxon (Moulton, 1948, Rev. de Entomologia 19: 87) was described as a pale color form in a key to the species of *Frankliniella,* but neither the description of the type materials nor the designation of the type was given. Arnaud and Lee (1973, Occ. Papers Calif. Acad. Sci. 105: 35) enumerated the syntype series of 44 specimens which were so determined by Moulton and presently deposited in the California Academy of Sciences. This taxon was synonymized with the nominal species by Jacot-Guillarmod (1974, Ann. Cape Prov. Mus. Nat. Hist. 7: 827).

The entire series of syntypes was scrutinized. After 6 misidentified specimens were weeded out, the lectotype was selected and 37 paralectotypes from Illinois, Kansas, Arkansas, Louisiana, Texas, Florida and Cuba were inscribed. *F. tritici clara* ranges from brownish yellow to pale yellow in color with limited grayish brown wash on head, and usually with abdominal brownish blotchings, which are, however, practically indiscernible on some of the teneral specimens or on many of the mature specimens from the Far South (southern Texas and southern Florida) and Caribbean islands. A pale yellow female with weak abdominal blotchings from Arkansas (Monticello, flowers of buckeye, July 5, 1940, Delzie Demaree, #93, Lot 41-3161) was selected and so labelled for the lectotype.

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A NEW *PROTERIADES* WITH DISTRIBUTIONAL NOTES AND A KEY TO ITS SUBGENUS (*HOPLITINA*) (HYMENOPTERA: MEGACHILIDAE)

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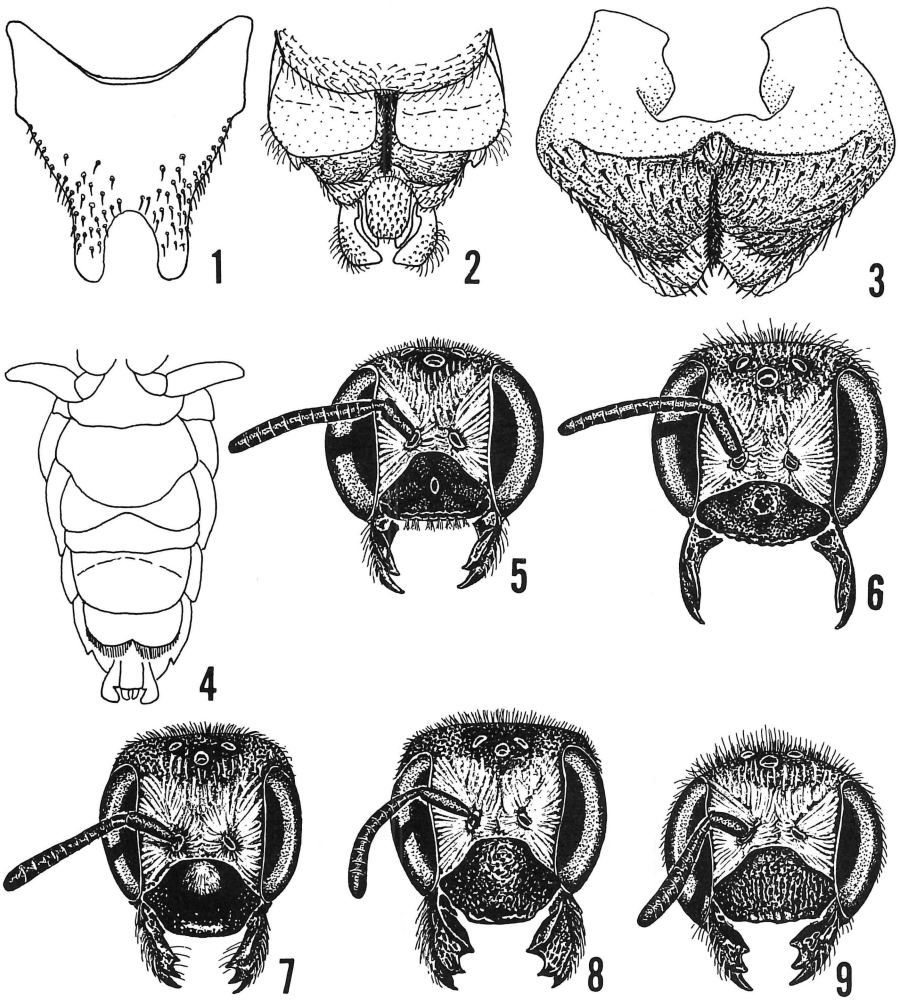
Proteriades is an interesting genus of small megachilid bees, usually with hooked hairs on the mouthparts. It is believed that females use these hairs to remove pollen from the small corolla tubes of *Cryptantha* flowers (Timberlake and Michener, 1950). Formerly it was believed that the genus was an oligolege of *Cryptantha* and its distribution was mainly California (Hurd and Michener, 1955). Recently the known distribution of several species has been extended east of California (LaBerge, 1973; Tepedino, 1974; and Parker, 1977, 1978), and the concept of its floral constancy has changed to allow for several host families (Parker, 1978).

Recent collecting in our southwestern desert areas has resulted in range extensions for several species previously known only from California. Also, an undescribed species of *Hoplitina* was found. This paper describes the new species, presents a key to the subgenus *Hoplitina* and discusses the distributions of five other species.

Proteriades (Hoplitina) torchioi, new species
(Figs. 1–4, 6)

Holotype male.—Black; reddish laterally on terga 1–4, red area interrupted medially and smaller on successive apical terga; terga 4–6 with apical reddish brown band, sterna 3–4 reddish brown laterally; wings light brown. Pubescence short, white, moderate, longest on frons, vertex; mouthparts without hooked hairs; hair pattern on sterna as follows: 1 with thin fringe of long apical hairs, 2 with few short scattered hairs, 3 with dense short wide hair-pad on median apical margin; 4 with thin apical fringe, 5–6 with thicker apical fringe. Punctation of body rather uniform, pits small adjacent but separated by smooth integument; clypeus impunctate on summit of basal bulge, and apical margin; less densely punctate on hypostomal area; sternum; hind face of propodeum; propodeal enclosure shagreen; pits on apical margin of sterna less dense; sterna 1, 2 more coarsely pitted than other sterna. Maxillary palpus 5 segmented (on paratype); apical clypeal margin crenulate, slightly thickened, basally swollen, protuberant; scape 3× as long



Figs. 1–9. Fig. 1. Sternum 7 of male *P. torchioi*. Figs. 2–4. Apical sterna of male *P. torchioi*. Fig. 2, enlarged view of apical sterna, genitalia. Fig. 3, sternum 6, note median tufted lobe. Fig. 4, outline of abdominal sterna (segments extended). Figs. 5–9. Front view of faces of *Hoplitina*. Fig. 5, male *P. bunocephala*. Fig. 6, male *P. torchioi*. Fig. 7, female *P. mojavensis*. Fig. 8, female *P. bullifacies*. Fig. 9, female *P. howardi*.

as wide (flagellomeres missing); supra antennal area flat except near ocular margin; distance between lateral ocelli greater than ocellocular distance ($1^1/_5\times$); distance from lateral ocelli to margin of vertex same as distance between lateral ocelli; postocciput in outline wider at median than at vertex ($1\frac{1}{2}\times$); coxae neither flanged nor produced; legs normal; sterna as follows

(Figs. 2–4): 1 slightly bowed medioapically, apical margin with small median excision, 2 with apical margin round greatly expanded, covering sterna 3, 4; 3 with apical margin concave, 4 with apical margin slightly angulate, 5 with apical margin slightly incurved, sternum 6 bilobed with median tufted swelling (Fig. 3), 7 elongate with truncate apical margin; terga 1–5 not toothed laterally, tergum 6 with small lateral tooth on apical margin, slightly notched medially; tergum 7 bilobed, space between lateral teeth greater than width of lobe (Fig. 1), (one lobe broken off of type); apical part of genitalia as in Fig. 2; length 7 mm; anterior wing 4.5 mm long.

Female.—As in male except usual sexual differences and clypeus mostly impunctate, margin produced beyond base of mandible, lateral apical margin angulate, truncate medially, corners round, width of truncation equal to distance between antennal scrobes, with depressed subapical pit row, base of clypeus bulbous in side view; frons below median ocellus flat in side view; terga 1–3 red, 4 only laterally; length 6–7 mm; anterior wing 4.5–5 mm long.

Variation.—The paratype male is more extensively red marked, with only median black spots on terga 2–6. Also, the clypeus on this specimen is less punctured (Fig. 6). Females have the same variable red pattern and some have fewer pits on the clypeus.

Types.—Holotype male; ARIZONA: 8 km (5 mi) N Kingman, Mojave Co., III-12-72 (P. Torchio, B. Apperson). Paratypes; 2 males. Walker Pass, Kern Co., Calif. VI-11-62; 6.25 km (10 mi) N Searchlight, Clark Co., Nevada, IV-21-66 (Torchio, Rust, Youssef) *Malacothrix*. Seven females; ARIZONA: 2.5 km (4 mi) W Chloride, Mojave Co., IV-28-72 (P. Torchio, G. Bohart, F. Parker), Oatman, Mojave Co., III-13-72 (P. Torchio, B. Apperson). NEVADA: Montgomery Pass, White Mts., VI-27-52 (S. Tirgari), VI-22-62 (G. Bohart) *Mentzelia*; Alamo, IV-28-73 (F. Parker, P. Torchio). Holotype deposited in the collection at the U.S. National Museum, No. 76201. Paratypes in the collection of the Bee Biology and Systematics Laboratory at Logan, Utah.

Range.—Desert areas of So. California, Nevada, and Arizona.

Systematics.—The male of *P. torchioi* resembles *P. lindsdalei* (Michener) as both species have the long bilobed tergum 7. However, differences in sternal characters readily distinguish them, as stated in the following key. The females of *P. torchioi* resemble those of *P. mojavensis* (Michener), as both species have a shiny, mostly impunctate clypeus. The depressed subapical pit row and the flat supra antennal area of *P. torchioi* distinguish it from *P. mojavensis*. The enlarged sternum 2 of male *P. torchioi* is unique among species of *Hoplitina*. The formation of sterna 2 and 7 closely resembles that found in subgenera with hooked hairs on their mouthparts, such as *Acrosmia* and *Penteriades*. Perhaps the presence or absence of hooked hairs on the mouthparts is an unnatural means of separating subgenera in

Proteriades. The peculiar, raised, tufted lobe of sternum 6 is characteristic of species of *Proteriades,* but its configuration varies among the species.

Biology.—Pollen removed from the scopa of field-collected females was identified as Hydrophyllaceae (*Nama, Phacelia*)—65.8%, Asteraceae (*Malacothrix*)—23.5%, and Fabaceae (*Lotus*?)—16.0%. All females had Asteraceae pollens, but three females had most Hydrophyllaceae pollen and two females had mostly Fabaceae pollen.

Key to Species of *Hoplitina*

Males

1. Apical margin of sternum 2 produced into a blunt spine or snout-like projection 2
   Apical margin of sternum 2 round, without median projection 3
2. Clypeus with large keel-like tubercle at base (Fig. 5); tergum 7 truncate apically; mid-coxa not flanged ..... *bunocephala* (Michener)
   Clypeus evenly convex; tergum 7 bilobed as in Fig. 1; mid-coxa with shiny flange ..... *lindsdalei* (Michener)
3. Sternum 1 nearly flat; apical margin of sterna 3–4 strongly concave; vertex without appressed pubescence 4
   Sternum 1 with large bulbous keel; apical margin of sternum 3 fairly straight; vertex with short appressed pubescence .... *bullifacies* (Michener)
4. Apical margin of sternum 2 round, but not covering sterna 3–4; tergum 7 weekly excavated medially or truncate 5
   Apical margin of sternum 2 expanded and covering sterna 3–4; tergum 7 strongly bilobed (Fig. 1), excavated areas wider than lateral arms ..... *torchioi* Parker
5. Tergum 7 truncate apically ..... *mojavensis* (Michener)
   Tergum 7 with small U-shaped excision apically .... *howardi* (Cockerell)

Females

1. Clypeus without keel-like swelling at base 2
   Clypeus with prominent keel-like swelling at base .... *bunocephala* (Michener)
2. Clypeus uniformly punctured or surface shagreen; distance between lateral ocelli ⅔ distance of ocellocular area 3
   Clypeus mostly impunctate, shiny (Fig. 7); distance between lateral ocelli greater than ocellocular distance 4
3. Clypeus flat, evenly pitted (Fig. 9), vertex without appressed pubescence ..... *howardi* (Michener)

Clypeus bulbous, surface shagreen (Fig. 8), vertex with appressed pubescence ..... *bullifacies* (Michener)

4. Clypeus with depressed subapical pit row, pits oblong; supra antennal area flat ..... *torchioi* Parker

Clypeus with few large scattered, evenly formed pits; supra clypeal area swollen ..... *mojavensis* (Michener)

Proteriades (*Penteriades*) *remotula* (Cockerell)

A female of this species was collected 23 mi SW Lordsburg, New Mexico on *Cryptantha*. This species was known previously only from California.

Proteriades (*Proteriades*) *deserticola* Timberlake and Michener

The range of this species has been extended from California to the following localities in Arizona: 15 mi E Topock; Lake Havasu City, 10 mi S Lake Havasu City; 11 mi N Quartzsite, and 5 mi E Parker.

Proteriades (*Proteriades*) *pygmaea* Timberlake and Michener

This species was previously known only from California, but it has been collected at the following locations in Arizona: Oatman (Mojave Co.), 10 mi S Oatman, Lake Havasu City, and 15 mi E Topock.

Proteriades (*Xerosmia*) *xerophila* (Cockerell)

The distribution of this black desert species now includes Arizona since I recovered several nests of *P. xerophila* from trap stems placed at 10 mi S Oatman.

Proteriades (*Hoplitina*) *mojavensis* (Michener)

The distribution of this species is extended from California to eastern Nevada, as I have reared *P. mojavensis* from trap stems placed at 7 mi NE Ash Springs, Nye Co., Nevada.

Acknowledgments

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A NEW APTEROUS SPECIES OF ARADIDAE FROM KENYA (HEMIPTERA)

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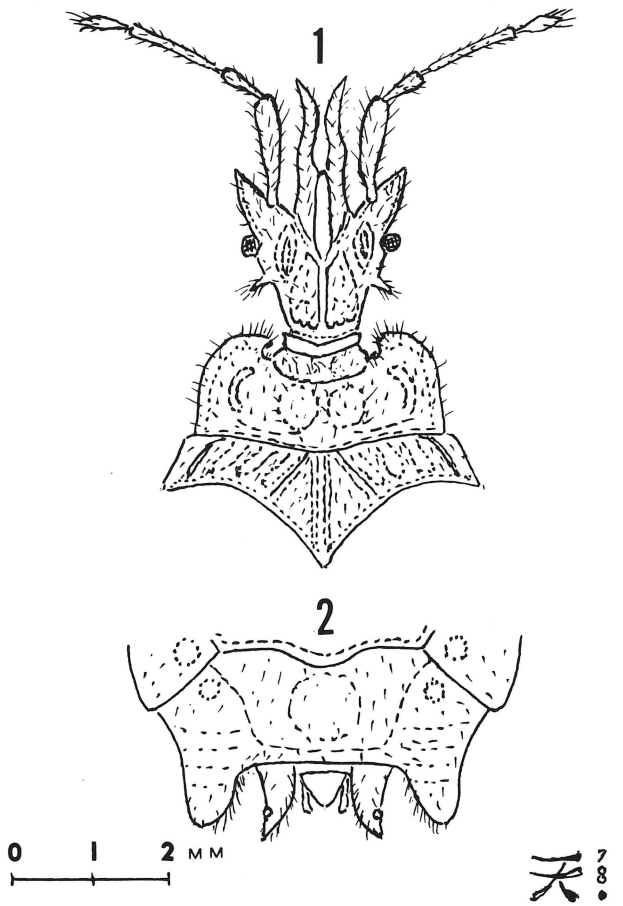
The genus *Usumbaraia* Kormilev, 1956, was established for reception of two apterous species, *Usumbaraia ampliata* Kormilev and *U. elongata* Kormilev, both from Tanganyika. The third species is now described from Kenya. The three species are not very closely related, differing by the shape of head, pronotum and the tip of abdomen. The new species is distinctly pilose, whereas the first two are naked.

All measurements were taken by micromillimeter eyepiece, 25 units = 1 mm. In ratios the first figure represents the length and the second the width of the measured portion.

Usumbaraia arnaudi, new species
(Figs. 1–2)

Female.—Elongate subtriangular, widening backward until connexivum V, then narrowing; postero-exterior angles of connexiva VII produced backward as large, flat, rounded lobes. The whole body sparsely covered with fine, rusty, decumbent hairs. Apterous.

Head.—Longer than its width across eyes (75:50). Anterior process very long and deeply cleft, projecting beyond tip of antennal segment I; clypeus raised, ½ as long as the whole anterior process; genae very long, cleft, with diverging tips. Antenniferous spines dentiform, very strong and diverging. Eyes small, semiglobose, protruding. Postocular borders straight and converging backward, terminating with 2 (1 + 1) strong, acute spines, directed sideways and slightly backward. Hind border behind postocular spines rounded and festooned because of rough, round granulation. Vertex raised in the shape of rhomboid, deeply incised anteriorly and rounded posteriorly, with Y-shaped, deep, median sulcus, extending from antenniferous spines to hind border of head. Infraocular callosities rounded anteriorly and tapering posteriorly, depressed along inner and outer borders. Antennae 1.79 as long as width of head across eyes (89.5:50); antennal segment I stout and clavate, II tapering toward base, III barely tapering toward base, IV fusiform; relative length of antennal segments I to IV are: 30:14:31:14.5. Labium preapical, arising from split atrium and not reaching hind border of labial groove, which is closed posteriorly. Ventral side of head laterad of labial



Figs. 1 and 2. *Usumbaraia arnaudi* n. sp., ♀. Fig. 1, Head, pronotum and mesonotum; Fig. 2, Tip of abdomen, from above.

groove transversely rugose and with 2 (1 + 1) longitudinal carinae sublaterally.

Pronotum.—Subrectangular, shorter than its maximum width across posterolateral angles (35:75) anterio-lateral angles rounded. Collar robust and sinuate anteriorly, fused posteriorly with a stout, transverse ridge. Between collar and anterior borders 2 (1 + 1) deep, rounded incisions. Anterior borders evenly rounded, forming an arc with lateral borders. Hind border slightly convex medially and sinuate laterally. Disc with a deep median sulcus extending from transverse ridge to hind border, flanked by 2 (1 + 1) large, flat, round elevations and further laterad with 2 (1 + 1)

narrow, curved ridges; deeply depressed between ridges and elevations and along borders.

Mesonotum.—Wide and short (35:95), medially produced backward into long, scutellum-like, rhomboidal plate; the latter with a double median carina, not reaching fore border and obliterated posteriorly; all borders of rhomboidal plate carinate; disc, laterad of rhomboidal plate, with 6 (3 + 3) oblique elevations and 2 (1 + 1) sublateral carinae.

Metanotum.—Separated into two large, uneven plates, separated from mesonotum by deep, and from tergum I and connexivum II by thin, sulci. Lateral borders almost straight, slightly diverging backward and terminating into 2 (1 + 1) small, angular processes.

Abdomen.—Longer than its maximum width across segment V (165:135) with rounded lateral borders from II to V, produced backward into 2 (1 + 1) large, flat, rounded lobes on VII. 2 (1 + 1) acute, flat paratergites placed at lower level than connexiva VII. Segment IX tricuspidate placed lower than paratergites. Terga I and II separated from metanotum and from each other by thin, transverse sulci, and from central dorsal plate by a deeper sulcus. Central dorsal plate consisting of segments III to VI, is subrectangular, with slightly convex borders and rather flat. Median ridge is wide and flat, acute anteriorly and truncate posteriorly, flanked by 2 (1 + 1) rows of larger, and by 2 (1 + 1) rows of smaller, round callous spots, each surrounded with carinate borders. Tergum VII raised and then depressed medially. Connexiva flat, each with 2 (one larger and one smaller) round, callous spots along inner borders. Connexiva II and III semifused together. Posteroexterior angles of connexiva II not protruding, III to VI progressively more protruding, VII, as was said, produced into large, rounded lobes. Spiracles II to VII ventral, placed far from border, VIII lateral and visible from above. Metathoracic scent gland opening long and moderately gaping, slightly visible from above.

Prosternum.—With inverted "T"-shaped median ridge. Meso- and metasternum flat.

Legs.—Trochanters free; femora and tibiae cylindrical, unarmed; tarsi with bristle-like arolias.

Color.—Black; labium and tarsi at base, yellow brown.

Total length 12.80 mm; width of pronotum 3.00 mm; width of abdomen 5.40 mm.

Holotype ♀, Kenya, Wundanyi, Teita Hills, 1450 m, 1.XI.1957, E. S. Ross & R. E. Leech leg.; deposited at California Academy of Sciences, San Francisco.

It is a pleasure to dedicate this striking species to Dr. Paul H. Arnaud, Jr.

Usumbaraia arnaudi is more related to *U. elongata* Kormilev 1956, but may be separated from it by the longer and more cleft genae, produced

beyond the tip of antennal segment I, by the postocular spines more developed, by the anterolateral angles of pronotum evenly rounded, by the disc with 2 (1 + 1) large, flat, round elevations laterad of the median sulcus, by the larger and more rounded lobes of connexivum VII, and by the paratergites (♀) larger and produced beyond tips of lobes of VII.

Acknowledgment

I wish to express my sincere thanks to Dr. Paul H. Arnaud, Jr., Curator and Chairman, Department of Entomology, California Academy of Sciences, San Francisco, by whose kind offices I have had the priviledge of studying this striking specimen.

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NEW HOST RECORDS FOR *ACANTHOSCELIDES* (COLEOPTERA: BRUCHIDAE)

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Many new records for species of the seed beetle genus *Acanthoscelides* have recently been published in revisions (Johnson, 1970), new species descriptions and ecological papers (Johnson and Kingsolver, 1971; Johnson 1974a, b; 1977a, b, c; Bottimer, 1969a, 1969b). Additional records for the genus have become available and need to be published so that they may be used in review ecological and taxonomic papers currently in preparation. I have listed these new, unpublished records below. The last two records are from the Tiliaceae but the rest are from the Leguminosae. Those species of *Acanthoscelides* listed by number were examined and found to be sufficiently different from named forms or too variable to be given a name. Revisionary studies currently under way will provide names for these entities in the near future.

Acknowledgments

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Special thanks are due to the Insect Identification and Beneficial Insect Introduction Institute, U.S. Department of Agriculture under Grants 12-14-100-9187(33) and 12-14-100-9970(33) which provided funds for collecting most of the records; and National Science Foundation Grant DEB78-05962 which provided funds for compilation of the data.

In the text of this paper, C. D. Johnson is abbreviated CDJ and L. J. Bottimer LJB.

Acanthoscelides aureolus (Horn)

1. *Astragalus bisulcatus* (Hook.) Gray: Colorado. Weld Co.: Pawnee Grassland Pasture, Nunn, 6 August 1971 (J. Chu).

2. *A. bisulcatus* var. *bisulcatus*: Utah. Uintah Co.: ca 4900′, 3 mi N Jensen, 14 July 1977 (CDJ #52-77).

3. *A. drummondii* Douglas: Colorado. Weld Co.: Pawnee Grassland Pasture, Nunn, 2 & 30 July & 6 August 1971 (J. Chu).

4. *A. grayii* Parry *ex* Wats.: Wyoming. Fremont Co.: Moneta, 23 July 1976 (collector unknown).

5. *A. humistratus* A. Gray: Colorado. Weld Co.: Pawnee Grassland Pasture, Nunn, 15 & 17 July 1976 (R. Lavigne).

6. *A. pattersoni* Gray: Colorado. Mesa Co.: Fruita, 28 December 1937 (LJB #76v).

7. *A. praelongus* var. *lonchopus* Barneby: Arizona. Navajo Co.: ca 5500′, 9 mi NE Kayenta, 16 July 1977 (CDJ #62-77).

8. *A. racemosus* (Pursh): South Dakota. Stanley Co.: 10 mi S Pierre, 28 December 1937 (H. M. Trelease, collector; LJB #76u).

9. *Oxytropis sericea* Nutt.: Colorado. Weld Co.: Pawnee Grassland Pasture, Nunn, 2 & 6 August 1971 (J. Chu & R. L. Lavigne).

A. biustulus (Fall)

1. *Desmodium cinerascens* Gray: Arizona. Pima Co.: 5000′, Madera Canyon, Santa Rita Mts., 9 September 1925 (LJB #54 n 8). Cochise Co.: 1 mi NW Bisbee, 7 October 1977 (CDJ #121-77).

2. *D. neomexicanum* Gray: Arizona. Pima Co.: Madera Canyon, Santa Rita Mts., 9 September 1925 (LJB #54 n 9).

A. chiricahuae (Fall)

1. *Mimosa brandegei* Robinson: Mexico. Baja California Sur: ca 1600′, 9 mi S El Triunfo, 26 December 1975 (CDJ #124-75).

2. *M. laxiflora* Bentham: Mexico. Sonora: ca 3 mi W San Carlos Bay, 22 December 1972 (CDJ #139-72).

3. *M. palmeri* Rose: Mexico. Sonora: 14 mi W Alamos, 24 February 1973 (CDJ #166-73).

4. *M. monancistra* Bentham: Mexico. Jalisco: Chapala, 17 August 1949 (LJB #125s).

A. clitellarius (Fähraeus)

1. *Acacia* aff. *riparia*? HBK: Mexico. Jalisco: 56 mi S Puerto Vallarta, 9 March 1973 (CDJ #448-73).

2. *Piptadenia flava*? (Spreng.) Benth.: Mexico. Jalisco: 34 mi NW Barra de Navidad, 9 March 1973 (CDJ #439-73).

A. collusus (Fall)

1. *Amorpha canescens* (Nutt.) Pursh: Nebraska National Forest, Halsey, Nebraska, 14 November 1931 (LJB #63v).

A. difficilis (Sharp)

1. *Mimosa albida* Humb. & Bonpl.: Costa Rica. Guanacaste: Santa Rosa N.P., 15 February 1976 (D. H. Janzen).

A. distinguendus (Horn)

1. *Rhynchosia difformis* (Ell.) DC: Florida. Alachua Co.: Gainesville, 21 August 1960 (LJB #108i).
2. *R. galactioides* Endl. *ex* Walp.: Florida. Santa Rosa Co.: 4 mi SW Milton, 4 August 1954 (LJB #108k).

A. floridae (Horn)

1. *Amorpha fruticosa* Linnaeus: Florida. Pinellas Co.: Dunedin, 1 February 1930 (LJB #58o); Alachua Co.: Gainesville, 17 October 1938 (LJB #81o). Washington, D.C.: Agricultural Grounds, 8 September 1927, 13 March 1931, 29 May 1928, Fall 1929 (LJB ##54u4, 61z, 54x9, 59d). Maryland. Prince Georges Co.: College Park, 4 November 1942 (LJB #82f). Michigan: LaSalle, 10 September 1934 (LJB #69w). South Dakota. Union Co.: Vermillion, 29 December 1942 (LJB #82a). Oklahoma. Payne Co.: Stillwater, 5 January 1943 (H.I. Featherly, collector; LJB #82c). Texas: Lake Charlotte, 24 September 1923 (LBJ #52c5).

A. fraterculus (Horn)

1. *Astragalus caryocarpus* Ker-Gawl.: Canada. Manitoba: Aweme, 23 May 1930 (R. M. White; LJB #878).
2. *A. crassicarpus* Nutt. var. *paysonii:* Colorado. Weld Co.: Pawnee Grassland Pasture, Nunn, 15 July 1977 (R. Lavigne).
3. *A. hyalinus* M. E. Jones: Wyoming. Albany Co.: Jelm, 29 August 1976 (R. Lavigne).
4. *A. missouriensis* Nutt.: Colorado. Weld Co.: Pawnee Grassland Pasture, Nunn, 1 June 1972 (R. Lavigne).
5. *A. pattersoni* Gray: Colorado. Mesa Co.: Fruita, 28 December 1937 (S. F. Trelease; LJB #76v).
6. *A. pectinatus* Dougl. *ex* Hook.: Colorado. Weld Co.: Pawnee Grassland Pasture, Nunn, 29 July, 5 & 6 August 1971 (J. Chu).

A. kingsolveri Johnson

1. *Indigofera lindheimeriana* Scheele: Texas. Uvalde Co.: Concan, 6 July 1947 (LJB #88i).

A. lobatus (Fall)

1. *Astragalus humistratus* Gray: Arizona. Coconino Co.: base, south slope Mt. Elden, Flagstaff, 16 September 1972 (CDJ #64-72).

2. *A. mollisimus* Torr. var. *bigelovii* (Gray) Barneby: Arizona. Cochise Co.: ca 4000′, Bisbee-Douglas Int. Airport, ca 8 mi N Douglas, 11 June 1977 (CDJ #35-77).

3. *A. mollisimus* var. *marcidus* (Rydb.) Barneby: Texas. Brewster Co.: Marathon, 19 June 1957 (LJB #100l); Big Bend National Park: Basin, 20 June 1957 (LBJ #100t); Green Gulch, 20 June 1957 and 14 May 1959 (LBJ #100u & 104a).

A. longistilus (Horn)

1. *Lespedeza capitata* Michx.: New Jersey. Ocean Co.: Lakehurst, 17 June 1934 (LJB #69i); Camden Co.: Haddon Heights, July 1935, 19 July 1932, 8 July 1931 (LJB ##67z, 63s, 62s); Ocean Co.: Forked River, 17 June 1934 (LJB #69o); Atlantic Co.: Mays Landing, July 1933 (LJB #79o); Marmora, 4 July 1938 (LJB #78c). New York. Suffolk Co.: Westbury, Long Island, 22 July 1937 (LJB #76c).

2. *L. texana* Britt. *ex* Small: Texas. Kerr Co.: Kerrville, 7 July 1950 and 4 October 1955 (LJB ##91y & 96q).

3. *L. virginica* (L.) Britt.: Texas. Bastrop Co.: Bastrop State Park, 15 April 1959 (LJB #103k).

A. macrophthalmus (Schaeffer)

1. *Leucaena esculenta* Bentham: Mexico. Jalisco: ca 5100′, 5 mi S Zacoalco, 6 March 1973 (CDJ #348-73); Chapala, 16 August 1949 (LJB #125p).

2. *L. lanceolata* Wats.: Mexico. Sinaloa: 3 mi SE Escuinapa, 10 March 1973 (CDJ #485-73); Sonora: 2 mi E Alamos, 29 December 1977 (CDJ #188-77).

3. *L. macrophylla* Bentham: Mexico. Jalisco: ca 4000′, 8 mi N Tonila, 6 March 1973 (CDJ #361-73).

4. *L. pulverulenta* (Schl.) Bentham: Texas. Hidalgo Co.: McAllen, July 1923 (LJB #52a). Cameron Co.: Brownsville, 29 October 1927 & 21 September 1947 (LJB ##54w & 89e). Nueces Co.: Corpus Christi, 8 September 1963 (LJB #116t).

5. *L. retusa* Benth. *ex* Gray: Texas. Kimble Co.: Junction, 26 August 1924 & 14 September 1946 (LJB ##52x6 & 87e); Sutton Co.: Sonora, 8 August 1961 (LJB #112j); Schleicher Co.: El Dorado, 6 August 1947 (H. R. Reed, collector; LJB #90f).

6. *L. salvadorensis* Standley: San Andres, El Salvador, 6 June 1958 (LJB #102d).

A. mexicanus (Sharp)

1. *Mimosa* nr. *albida* Humb. & Bonpl.: Mexico. Jalisco: 34 & 52 mi NW Barra de Navidad, 9 March 1973 (CDJ ##437-73 & 443-73); 56 mi S Puerto Vallarta, 9 March 1973 (CDJ #451-73).
2. *M. brandegei* Robinson: Mexico. Baja California Sur: ca 1600′, 9 mi S El Triunfo, 26 December 1975 (CDJ #124-75).
3. *M. laxiflora* Bentham: Mexico. Sonora: 13 mi E Navojoa, 25 December 1972 (CDJ #167-72).
4. *M. monancistra* Bentham: Mexico. Jalisco: Chapala, 17 August 1949 (LJB #125s).
5. *M. palmeri* Rose: Mexico. Sonora: Lake Mocuzari, 24 December 1972 (CDJ #150-72); 14 mi W Alamos, 24 February 1973 (CDJ #166-73).
6. *M. pudica* Linnaeus: Panama. Canal Zone: Summitt Gardens, Summitt, 27 January 1964 (LJB #119r).
7. *M. setigera* Brit. & Rose: Mexico. Jalisco: 15 mi W Magdalena, 30 December 1972 (CDJ #202-72).

A. mixtus (Horn)

1. *Astragalus praelongus* var. *lonchopus* Barneby: Arizona. Navajo Co.: ca 5500′, 9 mi NE Kayenta, 16 July 1977 (CDJ #62-77).
2. *A. thurberi* Gray: Arizona. Cochise Co.: ca 4000′, 4 mi W Douglas, 11 June 1977 (CDJ #33-77); ca 4000′, Bisbee-Douglas Int. Airport, ca 8 mi N Douglas, 11 June 1977 (CDJ #34-77).

A. modestus (Sharp)

1. *Aeschynomene rudis* Bentham: Mexico. Jalisco: lakeside, 3 mi W Chapala, 4 January 1973 (CDJ #55-73).

A. obrienorum Johnson

1. *Cassia villosa* Mill.: Mexico. Baja California Sur: ca 1600′, 9 mi S El Triunfo, 26 December 1975 (CDJ #122-75).
2. *Cassia armata* Wats.: California. San Bernardino Co.: 2100′, 21 mi W Needles, 8 August 1978 (CDJ #249-78).

A. obsoletus (Say)

1. *Tephrosia ambigua* D. Dietr.: Florida. Orange Co.: Orlando, 25 June 1928 (LJB #55a9).
2. *T. spicata* (Walt.) Torr. & Gray: Florida. Polk Co.: Polk City, 13 June 1929 (LJB #55c6).
3. *T. virginica* Bigel.: Virginia: Barcroft, 6 September 1927 (LBJ #54u1).

A. obvelatus

1. *Phaseolus glabellus* Piper: Mexico. Hidalgo: Tlauchinal, summer 1978 (A. Delgado).

A. oregonensis Johnson

1. *Petalostemum ornatus* Dougl. *ex* Hook.: Washington: Kennewick, 10 October 1937 (collector unknown).

A. perforatus (Horn)

1. *Astragalus canadensis* Linnaeus: Washington, D.C. 8 March 1931 (LJB #61x).

A. pertinax (Sharp)

1. *Aeschynomene* sp.: Costa Rica. Guanacaste: Santa Rosa N.P., 31 December 1975 (D. H. Janzen).

A. pullus (Fall)

1. *Astragalus thurberi* Gray: Arizona. Cochise Co.: ca 4000′, Bisbee-Douglas Int. Airport, ca 8 mi N Douglas, 11 June 1977 (CDJ #34-77).
2. *A. trichopodus* A. Gray var. *lonchus* (M. E. Jones) Barneby: Mexico. Baja California: ca 2 mi S San Quintin, 20 December 1975 (CDJ #85-75).

A. quadridentatus (Schaeffer)

1. *Mimosa berlandieri* A. Gray *ex* Torr.: Texas. Hidalgo Co.: 4 mi S Pharr, 24 October 1947 (LJB #90c).
2. *M. galeottii* Bentham: Mexico: Morelos. 7500′, 18 February 1925 (LJB #53n6).

A. rufovittatus (Schaeffer)

1. *Tephrosia cana* Brandeg.: Mexico. Baja California Sur: 4 mi E Cabo San Lucas, 27 December 1975 (CDJ #134-75).
2. *T. cinerea* Pers.: Mexico. Jalisco: 10 mi S Puerto Vallarta, 9 March 1973 (CDJ #461-73).
3. *T. thurberi* (Rydb.) C. E. Wood: Arizona. Pima Co.: Bog Springs Camp, Madera Canyon, 14 October 1976 (CDJ #47-76). Cochise Co.: Ramsey Canyon, 28 September 1956 (LJB #98r).

A. schrankiae (Horn)

1. *Mimosa* nr. *albida* Humb. & Bonpl.: Mexico. Jalisco: 34 mi NW Barra de Navidad, 9 March 1973 (CDJ #437-73).

2. *M. quadrivalis* Linnaeus: Mexico. Jalisco: ca 1200′, 18 mi N Barra de Navidad, 2 January 1973 (CDJ #13-73).

3. *M. setigera* Brit. & Rose: Mexico. Jalisco: 15 mi W Magdalena, 30 December 1972 (CDJ #202-72).

4. *Schrankia microphylla* (Dryand.) Standl.: Texas. Liberty Co.: Liberty, 11 & 15 September 1923 (LJB #52b6); Cass Co.: Maud, 2 August 1955 (LJB #95l). Florida. Polk Co.: Lake Alfred, 24 June 1928 (LJB #54z7).

5. *S. roemeriana* (Scheele) Blankenship: Texas: Bexar Co., 19 June 1962 (LBJ #113c); Kerr Co.: Kerrville, Fall 1947 (LBJ); Menard Co.: Menard, 16 June 1946 (LJB #85z).

A. seminulum (Horn)

1. *Dalea aurea* Pursh: Texas. Johnson Co.: Cleburne State Park, 27 July 1959 (LJB #105a).

2. *D. enneandra* Nutt.: Texas. Johnson Co.: 9 mi S Cleburne, 2 August 1959 (LJB #105d). Menard Co.: Menard, 6 July 1946 (LJB #87h).

3. *D. frutescens* Gray: Texas. Kerr Co.: Kerrville, 6 October 1958 (LJB #104u).

4. *Petalostemum feayi;* Chapm.: Florida. Polk Co.: Lake Alfred, 22 & 27 August 1929 (LJB #56w); Lake Alfred, 7 September 1929 (LJB #56s).

5. *P. stanfieldii* Small: Texas. Menard Co.: Menard, 20 June 1946 (LJB #86m).

A. submuticus (Sharp)

1. *Amorpha fruticosa* var. *angustifolia* Pursh: Texas. Dallas Co.: Dallas, 14 & 20 October 1927 (LJB #54v); NE of Dallas, 19 October 1927 (LJB #54v4).

Acanthoscelides tridenticulatus Bottimer

1. *Mimosa somnians* Humb. & Bonpl.: Mexico. Nayarit: ca 4000′, 27 mi SE Tepic, 2 March 1973 (CDJ #312-73).

A. zeteki Kingsolver

1. *Cajanus bicolor* DC: Panama. Canal Zone: Frijoles, 2 January 1964 (LJB #118o).

2. *Rhynchosia calycosa* Hemsl.: Panama. Canal Zone: Barro Colorado Island, end of Barbour Trail, 24 February 1964 (LJB #121o).

Acanthoscelides sp. #1

1. *Aeschynomene americana* Linnaeus: Mexico. Nayarit: ca 3500′, 24 mi NW Ixtlan Del Rio, 5 January 1973 (CDJ #77-73).

Acanthoscelides sp. #2

1. *Desmodium tortuosum* (Sw.) DC: Mexico. Jalisco: hillside, 4 mi W Chapala, 4 January 1973 (CDJ #50-73); ca 4000′, 27 mi W Magdalena, 5 January 1973 (CDJ #72-73).

Acanthoscelides sp. #3

1. *Desmodium tortuosum* (Sw.) DC: Mexico. Jalisco: hillside, 4 mi W Chapala, 4 January 1973 (CDJ #50-73). Sonora: Lake Mocuzari, 22 December 1976 & 29 December 1977 (CDJ ##130-76 & 192-77); ca 0.5 mi E Alamos, 28 December 1977 (CDJ #187-77).

Acanthoscelides sp. #4

1. *Aeschynomene* sp.: Costa Rica. Guanacaste. Santa Rosa N.P., 31 December 1975 (D. H. Janzen).

Acanthoscelides sp. #5

1. *Acacia cornigera* (Linnaeus) Willd.: Mexico. Veracruz: 10 mi E Acayucan, 15 June 1968 (CDJ #116-68).

Acanthoscelides sp. #6

1. *Calopogonium mucunoides* Desv.: Mexico. Jalisco: ca 1200′, 18 mi N Barra de Navidad, 2 January 1973 (CDJ #14-73). Nayarit: 43 mi SW Compostela, 28 February 1973 (CDJ #270-73); 3 mi SE Sayulita, 1 March 1973 (CDJ #279-73).

Acanthoscelides sp. #7

1. *Dalea* aff. *submontana* Rose: Mexico. Jalisco: hillside, 4 mi W Chapala, 4 January 1973 (CDJ #51-73); lakeside, 3 mi W Chapala, 4 January 1973 (CDJ #54-73); ca 4200′, 4 mi SE Tequila, 5 January 1973 (CDJ #60-73). Nayarit: ca 3500′, 24 mi NW Ixtlan Del Rio, 5 January 1973 (CDJ #79-73).

Acanthoscelides sp. #8

1. *Desmodium adscendens* DC: Panama. Canal Zone: Frijoles, 26 December 1963 (LJB #119f).
2. *D. intortum* Urb.: Panama. Chiriqui: Volcan de Chiriqui, 7 January 1964 (LJB #123g).

Acanthoscelides sp. #9

1. *Eysenhardtia texana* Scheele: Texas. Val Verde Co.: Comstock, July 1957 (LJB #100e).

Acanthoscelides sp. #10

1. *Leucaena lanceolata* Wats.: Mexico. Sinaloa: 4 mi N Mazatlan, 29 December 1972 (CDJ #195-72); 33 mi N Mazatlan, 7 January 1973 (CDJ #126-73); near beach, 6 mi N Mazatlan, 26 February 1973 (CDJ #217-73); 3 mi SE Escuinapa, 10 March 1973 (CDJ #485-73). Nayarit: 2 mi E San Blas, 6 January 1973 (CDJ #98-73); 8 mi S Acaponeta, 27 February 1973 (CDJ #237-73); 14 mi SE Sayulita, 1 March 1973 (CDJ #296-73); 8 mi S Acaponeta, 10 March 1973 (CDJ #480-73).
2. *L. macrophylla* Bentham: Mexico. Jalisco: ca 4000′, 8 mi N Tonila, 6 March 1973 (CDJ #361-73).

Acanthoscelides sp. #11

1. *Leucaena lanceolata* Wats.: Mexico. Sinaloa: 4 mi N Mazatlan, 29 December 1972 (CDJ #195-72); near beach, 6 mi N Mazatlan, 26 February 1973 (CDJ #217-73). Nayarit: 43 mi SW Compostela, 28 February 1973 (CDJ #274-73). Jalisco: ca 1200′, 18 mi N Barra de Navidad, 2 January 1973 (CDJ ##19-73 & 21-73).

Acanthoscelides sp. #12

1. *Leucaena esculenta* Bentham: Mexico. Veracruz: 10 mi E Acayucan, 15 June 1968 (CDJ #115-68).

Acanthoscelides sp. #13

1. *Lysiloma divaricata* (Jacq.) Macbride: Mexico. Oaxaca: 3500′, 51 mi SE Oaxaca, 6 July 1968 (CDJ #229-68).

Acanthoscelides sp. #14

1. *Mimosa albida* Humb. & Bonpl.: Mexico. Nayarit: ca 4000′, 27 mi SE Tepic, 2 March 1973 (CDJ #313-73).

Acanthoscelides sp. #15

1. *Mimosa albida* Humb. & Bonpl.: Mexico. Veracruz: 4200′, 5 mi NE Huatusco, 12 June 1968 (CDJ #77-68).

Acanthoscelides sp. #16

1. *Mimosa albida* Humb. & Bonpl.: Mexico. Veracruz: 4200′, 5 mi NE Huatusco, 12 June 1968 (CDJ #77-68).

Acanthoscelides sp. #17

1. *Mimosa pigra* Linnaeus: Mexico. Nayarit: 3 mi S Rosa Morada, 26 August 1965 (CDJ); 12 mi N Rosa Morada, 12 July 1968 (CDJ #278-68).
2. *M. dormiens* Humb. & Bonpl. *ex* Willd.: Mexico. Sinaloa: 8 mi SE Mazatlan, 23 August 1965 (CDJ).

Acanthoscelides sp. #18

1. *Triumfetta lappula* Linnaeus: Mexico. Nayarit: ca 2800′, 6 mi NW Tepic, 5 January 1973 (CDJ #92-73). (Tiliaceae)

Acanthoscelides sp. #19

1. *Heliocarpus attenuatus* S. Wats.: Mexico. Sonora: 28 December 1977 (CDJ #181-77). (Tiliaceae)

Acanthoscelides sp. #20

1. *Dalea cliffortiana* Willd.: Mexico. Nayarit: ca 3500′, 24 mi NW Ixtlan Del Rio, 5 January 1973 (CDJ #75-73).
2. *D. leporina* (Ait.) Bullock: Mexico. Jalisco: lakeside, 3 mi W Chapala, 4 January 1973 (CDJ #56-73).
3. *D. scandens* (Mill.) R. T. Clausen var. *occidentalis* (Rydb). Barneby: Mexico. Jalisco: ca 1400′, 20 mi N Barra de Navidad, 8 March 1973 (CDJ #432-73).
4. *D. tomentosa* (Cav.) Willd. var. *tomentosa*: Mexico. Nayarit: ca 4000′, 27 mi SE Tepic, 2 March 1973 (CDJ #310-73).

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1979 COMMITTEE MEMBERS

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PAN-PACIFIC ENTOMOLOGIST
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SCIENTIFIC NOTE

FOOD PREFERENCES IN REARED WIREWORMS *CONODERUS EXSUL* (SHARP) (COLEOPTERA: ELATERIDAE)

The problem of rearing introduced species of insects becomes difficult when their food preferences are unknown. Such was the case with the wireworm *Conoderus exsul* (Sharp) which was originally described from New Zealand. Studies of the food preferences of *Limonius californicus* (Mann.), (Stone, 1941, Life history of the Sugar-Beet wireworm in Southern California, U.S.D.A. Tech. Bull. 744) showed that corn and wheat were superior to lima beans, in that more larvae pupated during the second year of their life cycle. Weights of corn or wheat fed larvae and subsequent adults were generally heavier than those reared on lima beans.

The effect of different foods on the rate of development of the wireworm *C. exsul* was determined by individually confining larvae which hatched on March 25, 1977, in 2 oz salve cans. They were fed an excess of each food bi-weekly, at which time the soil was also changed. The foods were softened by soaking in water overnight. Twenty larvae were involved in each test.

As indicated in Table 1, wheat was superior to the other foods, since

Table 1. Effect of different foods on rate of development of the wireworm *Conoderus exsul* Sharp, Riverside, Cal. 1977–78.

		Days to complete larval period						
	Records (No.)	1977			1978			
		Min.	Max.	Mean	(No.)	Min.	Max.	Mean
Wheat	11	144	181	156	8	275	323	300
Corn	6	117	165	147	13	269	366	301
Lima bean	6	130	177	160	11	293	386	316

more larvae matured the first year, and there was less mortality. Corn and beans yielded fewer pupations the first year. Bean seed appeared more susceptible to rot and perhaps less palatable. Apparently the larvae of this species can exist on many kinds of food as it has already been recorded from 14 counties in California and from various localities in Arizona.

The earliest pupation in the same year occurred July 21 and the latest September 22. Pupation the second year began December 19 and terminated April 15. Under favorable food conditions a sizeable number of this species may complete development in one year, which could account for its rapid spread.

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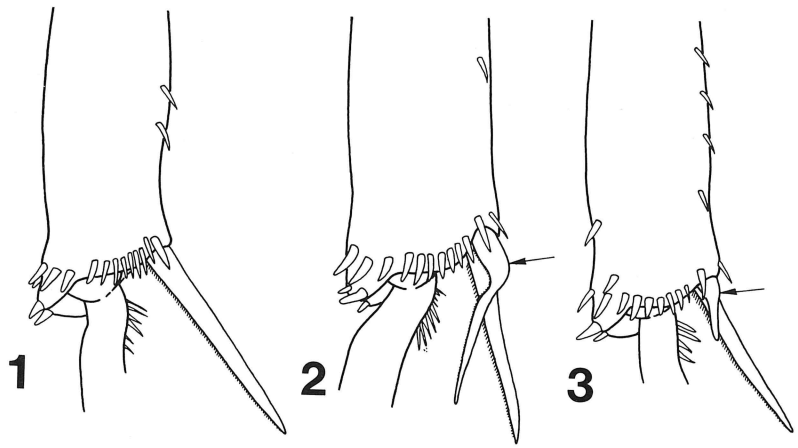
PAN-PACIFIC ENTOMOLOGIST
Vol. 55, No. 1, p. 73

SCIENTIFIC NOTE

AN EXTRA MIDTIBIAL SPUR IN AN ISLAND POPULATION OF *TRYPOXYLON TRIDENTATUM* PACKARD (HYMENOPTERA: SPHECIDAE: LARRINAE: TRYPOXYLONINI)

One apical midtibial spur (Fig. 1) is characteristic of all sphecid wasps in the subfamily Larrinae (Bohart and Menke, 1976, Sphecid Wasps of the World, Univ. Calif. Press, Berkeley, 695 pp.). Therefore, I was surprised to find that a second spur is often present on *Trypoxylon tridentatum tridentatum* Packard specimens from Santa Cruz Island, Santa Barbara Co., California. One hundred and two specimens in the collection at the University of California at Davis were reared from 37 trap stems by D. S. Horning. The trap stems, all from Canyon del Medio on the island, were collected in September 1968. In 25 of 50 specimens reared from 14 stems, there was a second midtibial spur; specimens reared from the remaining 23 stems were normal. The second spur is variable (Figs. 2 and 3) even on



Figs. 1–3. Posterior view of left midtibia of *Trypoxylon tridentatum*: 1, normal from Santa Ynez Mts., Santa Barbara Co., Cal. (mainland); 2, female, and 3, male, with additional midtibial spur—both are from Canyon del Medio, Santa Cruz Isl., Cal.

different sides of the same specimen. Eight specimens had the additional spur on only one side. The presence of the abnormal additional spur in a population on a small, isolated island suggests that genes controlling expression of the spur are perhaps maintained in the gene pool by unusual selective pressure or genetic drift.

Rollin E. Coville, *Division of Entomol. and Parasitol. Univ. Calif., Berkeley, CA 94720.*

PAN-PACIFIC ENTOMOLOGIST
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OBITUARY

HERBERT H. ROSS, 1908–1978

On November 2, 1978, one of our most illustrious entomologists, Dr. Herbert H. Ross, died in Athens, Georgia. Herb was born in Leeds, England, March 3, 1908 and was educated at the University of British Columbia (B.S.A. 1927) and the University of Illinois (M.S. 1929; Ph.D. 1933). Following his retirement from the Illinois Natural History Survey, Urbana, Illinois (1969) after many years of service (including Principal Scientist and Acting Chief), he joined the Entomology Department at the University of Georgia, where he retired in 1975.

The contributions that Dr. Ross made to the Biological Sciences are far reaching. His *Textbook of Entomology* (1965) and *Biological Systematics* (1974) are widely used in General Entomology and Systematic Biology courses, and although his excellent research on Trichoptera systematics is foremost in our minds, his prodigious publication record of over 200 papers includes studies of Orthoptera, Dermaptera, Homoptera, Hemiptera, Plecoptera, Hymenoptera, Megaloptera, and Diptera. In addition, his influence on biogeographical and aquatic entomological studies is immeasurable; his work undoubtedly ranks among the outstanding contributions in these areas.

Herb had a lifelong interest in the insect fauna of North America and he completed faunal studies on the Trichoptera of both Baja California (1951) and British Columbia (1952); among his last projects were systematic studies of insects from Pacific Islands. Long active in national and international scientific societies, he served as secretary-treasurer and president of both the Entomological Society of America and the Society for the Study of Evolution.

We express our sympathy to his wife Jean, his son Charles, and his sister Mary. His many contributions to science will certainly be remembered by scholars of the future just as his kind personal philosophy will be long remembered by those of us who were fortunate enough to have known him.

Donald G. Denning and Vincent H. Resh

PACIFIC COAST ENTOMOLOGICAL SOCIETY

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PROCEEDINGS

THREE HUNDRED AND EIGHTY-FOURTH MEETING

The 384th meeting was held 17 February 1978 at 8:00 p.m. in the Morrison Auditorium of the California Academy of Sciences, Golden Gate Park, San Francisco, with President Anderson presiding, and 40 members and 37 guests present.

The minutes of the meeting held 16 December 1977 were summarized. The following persons were elected to membership in the Society, regular members: Dr. John P. Figg-Hoblyn, Antonio Paulo Assis de Moraes, Dr. Charles D. Howell, Dr. Kirby W. Brown, Dr. Gene R. Kritsky; student members: Greg Spicer, Arthur L. Chan; regular family member, Mr. Robert Buickerood; student family member: Mrs. Lynn Kimsey.

Dr. E. Smith of the California Academy of Sciences discussed a recent volume on insect morphology. Dr. Thomas Eichlin, California Department of Food and Agriculture shared information relating to an infestation of sesiid borers in Lewiston, California. The following note was presented: **The activity of Lepidoptera on Oahu, Hawaii in January.**—During an eight day visit to the island of Oahu in mid-January, 1978, there were eight species of Rhopalocera in flight, out of a possible 14 or so known for the Hawaiian Islands. The eight species displayed here are: *Hylephila phyleus* (Drury); *Papilio xuthus* Linnaeus; *Pieris rapae* (Linnaeus); *Strymon bazochii gundlachianus* (Bates); *Lampides boeticus* (Linnaeus); *Vaga blackburni* (Tuely); *Agraulis vanillae incarnata* (Riley); and *Danaus plexippus* (Linnaeus).

The cabbage white, gulf fritillary and monarch appeared to be generally distributed on both the windward and leeward sides of Oahu. The remaining five species were found at specific locales only on the leeward (or sunny, dry) slopes. Gulf fritillaries were found in very large numbers, especially from the Kalihi district to Koko Head. They showed little variation, although averaging smaller than in mainland California. Adult monarchs were plentiful in many areas, and numerous ova, larvae and pupae were observed. Among the breeding populations, a low percentage are albinos. The albinistic form is more prevalent in the winter months, and three were observed on 23 January in the greater Honolulu area.

Additional species of butterflies recorded for the islands include: *Erionota thrax* Linnaeus; *Vanessa tameamea* Eschscholtz; *Vanessa atalanta rubria* (Fruhstorfer); *Cynthia virginiensis* (Drury); *Cynthia cardui* (Linnaeus); and *Tmolus echion* (Linnaeus).

The two endemics (*V. blackburni* and *V. tameamea*) are found only on the various islands in the Hawaiian chain. The two hairstreaks (*S. bazochii* and *T. echion*) were introduced from Mexico to control the also introduced plant lantana. All of the other species listed above appeared on the islands accidentally, some quite recently. The citrus swallowtail was first discovered on Oahu in April, 1971—presumably from other Pacific islands or southeastern Asia. The pae or bean blue was introduced nearly a century ago and has since become quite abundant. It is widely distributed in the Pacific, Philippines, Japan, China, etc., to southern Europe. Heterocera found on Oahu in January included: Sphingidae—*Macroglossum pyrrhostictum* (Butler); Noctuidae—*Plusia chalcites* Esper., *Melipotis indomita* (Walker), and *Hypena obsoleta* Butler, endemic, type locality Oahu; Geometridae—*Semiothisa santaremaria* (Walker), the Koa haole moth; Pyralidae—*Hymenia recurvalis* (Fabricius) and *Hedylepta localis* (Butler), endemic, type locality

Oahu. Those not noted above as endemics are widespread immigrants known from either the Pacific, Asia or North America. Robert L. Langston, Kensington, California.

The main speaker of the evening was **Ms. Deborah Green,** University of California, Berkeley. Her multi-media presentation, "Insect-Plant Coevolution," was enjoyed by all.

Refreshments were served in the Trustee's room following the meeting.— L. G. Bezark, Secretary.

THREE HUNDRED AND EIGHTY-FIFTH MEETING

The 385th meeting was held 17 March 1978 at 8:00 p.m. in the Morrison Auditorium of the California Academy of Sciences, Golden Gate Park, San Francisco, with President Anderson presiding, and 17 members and 8 guests present.

The minutes of the meeting held 17 February 1978 were summarized. Larry Bezark, San Jose State University, discussed a partially duplicated antenna of *Tetraopes discoideus* LeConte. Dr. J. A. Powell, University of California, Berkeley, presented the following note: *Grapholitha edwardsiana* (Kraft, 1907) (Tortricidae): *an endemic San Francisco moth nearing extinction.*—Kodachrome slides were exhibited showing adults, larvae and the habitat of this species, which was described from specimens in the Henry Edwards collection ("Cal.", "S. Fran., Cal."). It remained an enigma for more than half a century. A colony was discovered at the Presidio near Baker Beach in 1961, but that habitat was later destroyed. Adults fly in late April and May in association with *Lupinus arboreus,* and larvae feed inside the floral stalks. *Lupinus chamissonis,* which has short floral stalks, is not used, even where the two lupines grow interspersed. Because *L. arboreus* was one of the dominant plants of the S.F. sand hills, *G. edwardsiana* probably occurred extensively over the western part of the peninsula prior to urbanization. Survey during the past year revealed three colonies: two on parklands, the larger on bluffs north of Baker Beach, the other near the southeast end of Lake Merced; the third colony is partly on municipal property, in Daly City at the mouth of Guadelupe Canyon above John F. Kennedy school, recent construction of which probably destroyed most of the hostplant colony. Information regarding occurrence of *L. arboreus* at other sites on the peninsula is solicited.

The main speaker of the evening was **Dr. A. H. Purcell,** University of California, Berkeley. His presentation entitled "Of leafhoppers and wine: Sharpshooters and the mysterious vine disease in California," was enjoyed by all.

Refreshments were served in the Trustee's room following the meeting.— L. G. Bezark, Secretary.

THREE HUNDRED AND EIGHTY-SIXTH MEETING

The 386th meeting was held 21 April 1978 at 8:00 p.m. in the Morrison Auditorium of the California Academy of Sciences, Golden Gate Park, San Francisco, with 31 members and 24 guests in attendance.

The minutes of the meeting held 17 March 1978 were summarized.

The following persons were elected to membership in the Society, regular members: Dr. Robert F. Rockwell, Dr. Peter Maddison; student members: Ann E. Hajek, Jose A. Mari Mutt, Roger K. Shimer.

Dr. E. L. Smith reported on progress relating to morphological studies of living and extinct insect groups, and discussed features of the labrum. The following note was given: **Case making chrysomelid larvae from the California annual grassland.**—During a study of the California annual grassland (IBP), 14 small, cylindrical brown cases were found in 80 0.5M^2 samples covering five separate dates. The samples were taken with a quick trap, and the arthropods from both the clipped grass and the vacuumed litter were extracted by means of a Tullgren funnel. The brown cases had the appearance of mud, said

to be made of fecal materials (Boving and Craighead 1931), and were under 5 mm in length, about 4 times longer than wide, and with longitudinal, slightly spiraling broken ribs composed of 3 to 5 serially spaced ridges. The posterior end was rounded and closed, whereas the anterior end was flat but filled by the round flat head and legs of a larva.

The larvae key to the couplet delineating the chrysomelid subfamilies Cryptocephalinae and Lamprosominae. The latter contains only one California species, and this has not been taken at the San Joaquin Experimental Range. Of the Cryptocephalinae, 3 adults of *Pachybrachys punctatus* Bowditch were taken in September 1972 from the area to be sampled. No adults were taken in the quick traps.

The larvae were taken on only 5 of the 22 sample dates, and the totals per date were 2 (March 13, 1973), 4 (November 30, 1973), 1 (January 11, 1974), 5 (February 12, 1974) and 2 (March 14, 1974). With 16 samples being taken on each date the highest population on the open rolling slopes was equal to 0.63/M².—Craig Hasegawa and Donald Burdick.

The main speaker of the evening was **Dr. Bernard C. Nelson,** Public Health Biologist, Vector and Waste Management Section, California Department of Health, Berkeley. His discussion of bubonic plague in California was informative and well received by those in attendance.

Refreshments were served in the Trustee's room following the meeting.— L. G. Bezark, Secretary.

THREE HUNDRED AND EIGHTY-SEVENTH MEETING

The 387th meeting was the Annual Picnic, held at Del Valle Regional Park. Insect collecting and photography were enjoyed by the six stalwarts who attended.

THREE HUNDRED AND EIGHTY-EIGHTH MEETING

The 388th meeting was held 20 October 1978, at 8:00 p.m., in the Morrison Auditorium of the California Academy of Sciences, Golden Gate Park, San Francisco, with President Anderson presiding and 22 members and 20 guests in attendance.

The minutes of the meeting held 21 April 1978, and the Picnic held in May were summarized.

The following members were elected to the Society, regular member: Marilyn Vernon; student members: Heidi Dobson, Randall Boquist, Leonard Vincent, Gary Trimble, Ken Weiner, Steven Abe.

Harriet Reinhard showed slides of *Calosaturnia mendocino,* the larvae of which feed on Manzanita. J. Gordon Edwards, San Jose State University, described a project sending larvae of the Gypsy Moth to Pennsylvania for host preference studies. Among others, *Eucalyptus,* Coast Redwood and Giant Sequoia are hosts readily eaten by the larvae. The following notes were given.

A Possible New Species of Genus *Hybomitra* Found in California (Diptera: Tabanidae)

During late August, 1978, a single specimen of *Hybomitra* species was collected from a baited flight trap in Sierra County, California, by Maury Swoveland. The specific location of capture was Camp Leonard, San Francisco State University Sierra Nevada Field Campus on highway 49, six miles southwest of Sierra City. A malaise flight trap was baited with a black ball in an attempt to collect Tabanidae specimens for a field study project that was being conducted by Susan Opp, an Entomology student at San Francisco State University.

The specimen is thought to be a possible new species of *Hybomitra* by both Dr. Cornelius B. Philip, CAS, and Dr. Robert Lane, California Department of Public Health, Berkeley. The specimen differs from the three specimens of *Hybomitra rhombica* collected in the same area earlier in the summer due to a reddish abdominal coloration and

differing antennal characteristics. Taxonomically, the most closely related species appears to be *Hybomitra rupestris* which has never been reported as collected in California. Slight colorational and antennal differences also separate our specimen from this species, but for the time being, the specimen will be termed *Hybomitra* species near *rupestris,* until further bait trapping studies can be conducted in the Sierras in the summer of 1979.—Susan B. Opp, San Francisco State University.

A New Distribution and Habitat Record for *Anuroctonus phaiodactylus* (Wood) (Scorpionida: Vaejovidae)

Anuroctonus phaiodactylus is a common species of scorpion found in the coastal areas of southern California. Both males and females live in a permanently constructed burrow throughout their life cycle. Because of the burrowing activity these scorpions are found in hard packed soils.

In September 1977, while blacklighting at night, two male *A. phaiodactylus* were observed on the ground surface on Yucca Valley (San Bernardino County), California. This observation is noteworthy for two reasons; 1) It represents a new distribution record for the species, the closest previous record being San Bernardino (Pocock 1902, Scorpions Pedipalpi and Solfugae) and 2) It also represents an unusual habitat record for the species in that the males were found on an unstabilized sandy substrate. This type of soil is inconsistent with the scorpion's burrowing activity. Although it is very unusual to find *A. phaiodactylus* on the surface, males will emerge and migrate in search of females during the mating season.—M. L. Swoveland San Francisco State University.

The main speaker of the evening was **Dr. Martin C. Birch,** University of California, Davis. His program entitled "Chemical Communication in Bark Beetles," was well received by members and guests present.

Refreshments were served in the Trustee's room following the meeting.— L. G. Bezark, Secretary.

THREE HUNDRED AND EIGHTY-NINTH MEETING

The 389th meeting was held 17 November 1978 at 8:00 p.m. in the Morrison Auditorium of the California Academy of Sciences, Golden Gate Park, San Francisco, with President Anderson presiding and 26 members and 10 guests present.

The minutes of the meeting held 20 October 1978 were summarized. The auditing committee reported and the treasurer summarized the year; Paul Arnaud, Jr. stated that the treasurer's office is indebted to Mrs. V. Hawley (as volunteer) and Mrs. Gail Freihofer (Entomology Secretary) for their handling of the Society's accounts, billings, and mailing of publications, and to our member Mr. H. Vannoy Davis of Walnut Creek, California, not only for his audit of the Treasurer's records, but also for his completion of the Society's state and federal tax forms. The nominating committee brought forth the following names for office in 1979: President-elect Marius Wasbauer, Secretary Larry Bezark, and Treasurer Paul Arnaud, Jr.

The following persons were elected to membership in the Society, regular members: Gary L. Piper, T. A. West, Dr. W. G. Iltis; student members: Susan B. Opp, Susanne Muzzio, Andrew Coblentz, Harvey Ito, Lee Guidry.

Howell Daly reported on the death of Herbert H. Ross. Dr. Cornelius Philip discussed *Tabanus biguttatus,* the larvae of which form a plug to withstand the drying and cracking of surrounding mud.

The gavel was handed over to the new president, John Doyen, who introduced **Dr. John Anderson** and the presidential address entitled "The Biology and Behavior of Nose Bot Flies of California Black-tailed Deer." Refreshments were served in the Trustee's room following the meeting.— L. G. Bezark, Secretary.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

STATEMENT OF INCOME, EXPENDITURES AND CHANGES IN FUND BALANCES

Years Ended September 30, 1978 and 1977

	1978	1977
Income		
Dues and subscriptions	$ 8,432	$ 8,545
Reprints and miscellaneous	7,615	7,674
Sales of memoirs	375	326
Interest on savings accounts	872	915
Dividends, American Telephone & Telegraph Co.	352	244
Increase in value of capital stock of American Telephone & Telegraph Co.	(90)	250
	17,556	17,954
Expenditures		
Publication costs—Pan Pacific Entomologist	9,405	13,525
Reprints, postage and miscellaneous	2,928	3,078
	12,333	16,603
Increase in fund balances	5,223	1,351
Fund balances October 1, 1977 and 1976	27,920	26,569
Fund balances September 30, 1978 and 1977	$33,143	$27,920

STATEMENT OF ASSETS

September 30, 1978 and 1977

	1978	1977
Cash in bank		
Commercial account	$ 668	$ 927
Savings accounts		
General fund	11,015	6,765
Fall and Memoir Funds	13,491	12,483
Life membership fund	2,999	2,685
Total cash in bank	28,173	22,860
Investment in 80 shares of American Telephone & Telegraph Co. common stock (Life Membership and Fall Funds), at market value	4,970	5,060
	$33,143	$27,920

See accompanying notes to the financial statements.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

NOTES TO THE FINANCIAL STATEMENTS

Year Ended September 30, 1978

SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Accounting Method

Income, expenditures and assets are recorded on the cash basis of accounting.

Marketable Securities

American Telephone & Telegraph Co. common stock is carried at market value. Increases and decreases in value are reflected in income.

Income Tax

The Society is exempt from Federal income and California franchise tax.

Accounts Receivable

As of September 30, 1978 accounts receivable aggregated $884 as follows:

September, 1978 billings	$803
Prior billings	81
	$884

As Chairman of the Auditing Committee, and in accordance with its by laws, I have reviewed the financial records of the Society.

During the course of this review nothing was noted which indicated any inaccuracy in the foregoing statements.

H. Vannoy Davis
Chairman of the Auditing Committee

October issue mailed April 5, 1979

THE PAN-PACIFIC ENTOMOLOGIST
Information for Contributors

Papers on the systematic and biological phases of entomology are favored, including short notes or articles up to *ten* printed pages, on insect taxonomy, morphology, ecology, behavior, life history, and distribution. Excess pagination must be approved and *will* be charged to the author. Papers are published after acceptance in approximately the order that they are received. Papers of less than a printed page will be published as space is available, in **Scientific Notes.**

All manuscripts will be reviewed *before acceptance.*

Manuscripts for publication, proofs, and all editorial matters should be addressed to the editor.

General. — The metric system is to be used exclusively in manuscripts, except when citing label data on type material, or in direct quotations when cited as such. Equivalents in other systems may be placed in parentheses following the metric, *i.e.* "1370 m (4500 ft) elevation".

Typing. — Two copies of each manuscript must be submitted (original and one xerox copy or two xerox copies are suitable). All manuscripts must be **typewritten, double-spaced** throughout, with ample margins, and be on bond paper or an equivalent weight. **Carbon copies** or copies on paper larger than 8½ × 11 inches are not acceptable.

Underscore only where ***italics*** are intended in the body of the text. **Number all pages** consecutively and put authors name on each sheet. References to **footnotes** in text should be numbered consecutively. Footnotes **must** be typed on a separate sheet.

Manuscripts with extensive corrections or revisions will be returned to the author for retyping.

First Page. — The page preceding the text of the manuscript must include (1) the complete title, (2) the order and family in parentheses, (3) the author's name or names, (4) the institution with city and state or the author's home city and state if not affiliated (5) the complete name and address to which proof is to be sent.

Names and descriptions of organisms. — The first mention of a plant or animal should include the full scientific name with the author of a zoological name *not* abbreviated. Do not abbreviate generic names. Descriptions of taxa should be in telegraphic style. The International Code of Zoological Nomenclature must be followed.

Tables. — Tables are expensive and should be kept to a minimum. Each table should be prepared as a line drawing *or* typed on a separate page with heading at top and footnotes below. Number tables with Arabic numerals. Number footnotes consecutively for each table. Use only horizontal rules. Extensive use of tabular material requiring typesetting may result in increased charges to the author.

Illustrations. — No extra charge is made for line drawings or halftones. Submit only photographs on glossy paper and original drawings. Authors *must* plan their illustrations for reduction to the dimension of the printed page (117 × 181 mm; 4⅝ × 7⅛ inches). If possible, allowance should be made for the legend to be placed beneath the illustration. Photographs should not be less than the width of the printed page. Photographs should be mounted on stiff card stock, and bear the illustration number on the face.

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Figure legends. — Legends should be typewritten double-spaced on separate pages headed EXPLANATION OF FIGURES and placed following LITERATURE CITED. Do not attach legends to illustrations.

References. — All citations in text, e.g., Essig (1926) or (Essig 1958), must be listed alphabetically under LITERATURE CITED in the following format:

Essig, E. O. 1926. A butterfly migration. Pan-Pac. Entomol., 2:211–212.
Essig, E. O. 1958. Insects and mites of western North America. Rev. ed. The Macmillan Co., New York, 1050 pp.

Abbreviations for titles of journals should follow the list of *Biological Abstracts,* 1966, 47(21):8585–8601. For **Scientific Notes** the citations to articles will appear within the text, i.e. . . . "Essig (1926, Pan-Pac. Entomol., 2:211–212) noted . . .".

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